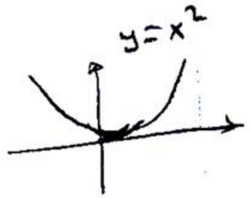
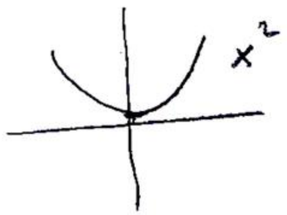
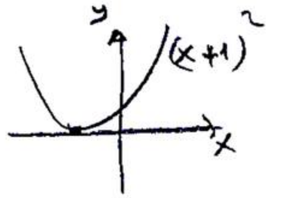
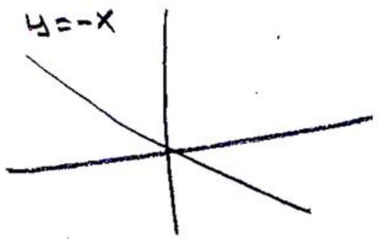

$y=x^2$

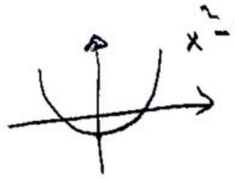

$(x-1)^2$

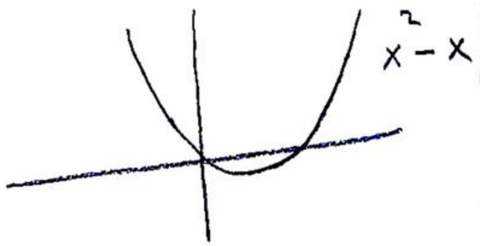

x^2

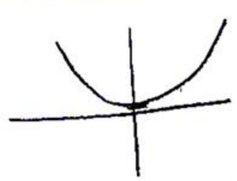

y
$(x+1)^2$
x


x^2+1

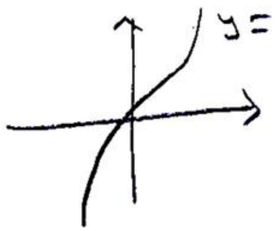

$y=-x$

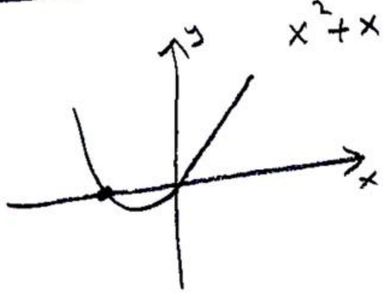

x^2-1

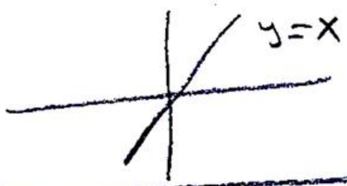

x^2-x

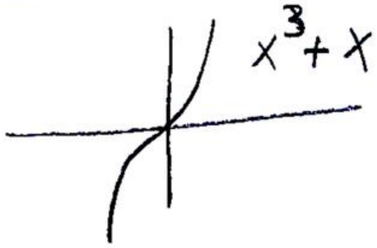

x^2


x

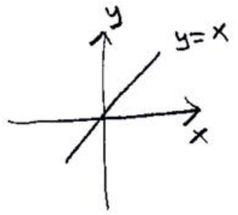

$y=x^3$

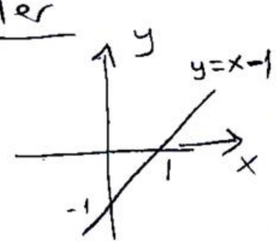

y
x^2+x
x

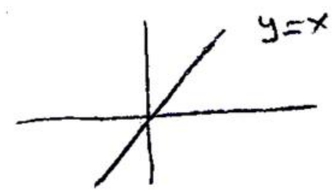

y=x

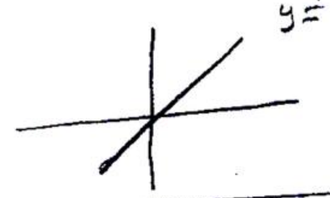

x^3+x

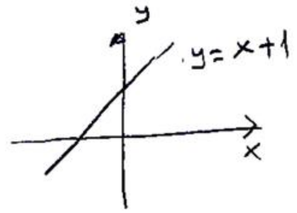
Grafikler

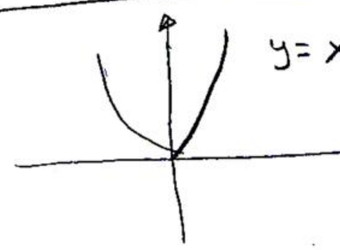

y
y=x
x

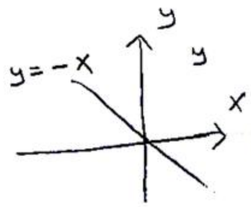

y
y=x-1
-1
1
x

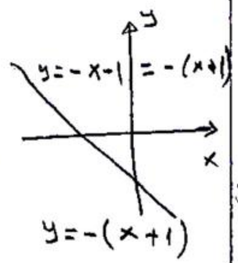

y=x

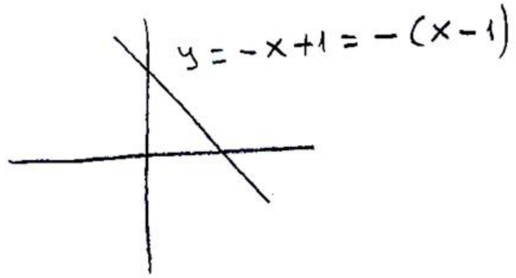

y=x


y
y=x+1
x

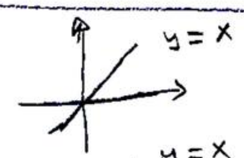

$y=x^2$

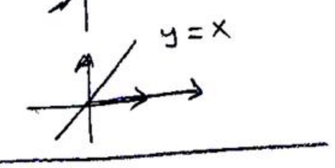

y=-x
y
x

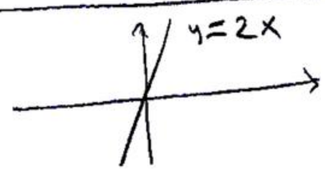

y=-x-1 = -(x+1)
x
y=-(x+1)

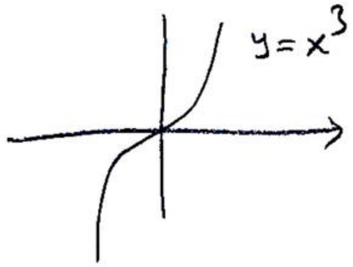

y=-x+1 = -(x-1)

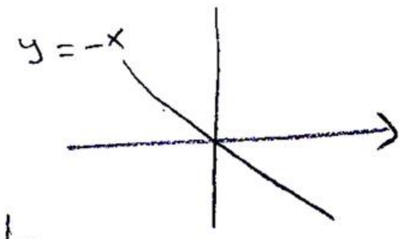
$y=x^3$
$y=x^2$
$y=x^2$
y=x
1
-1
1
-1
$y=x^3$


y=x

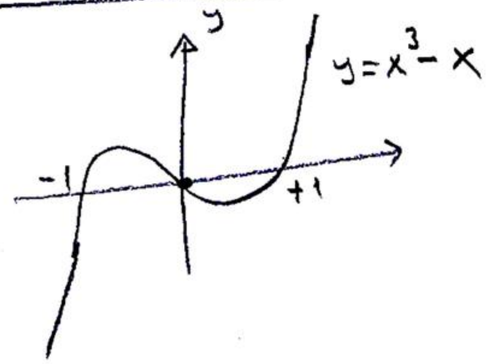

y=x

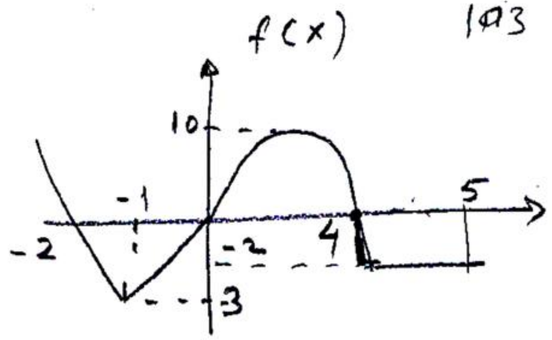

y=2x

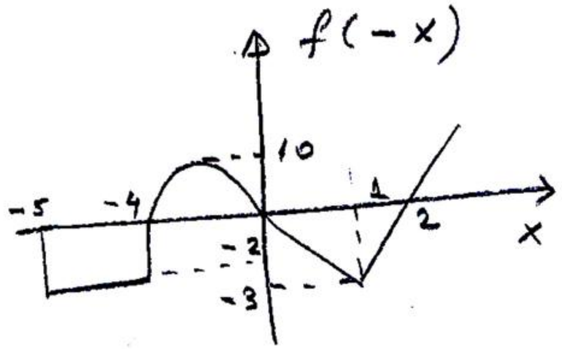

y = x³

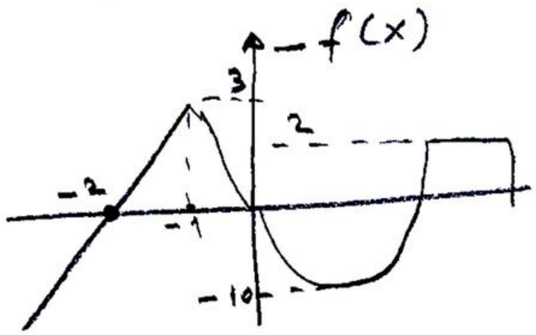

y = -x

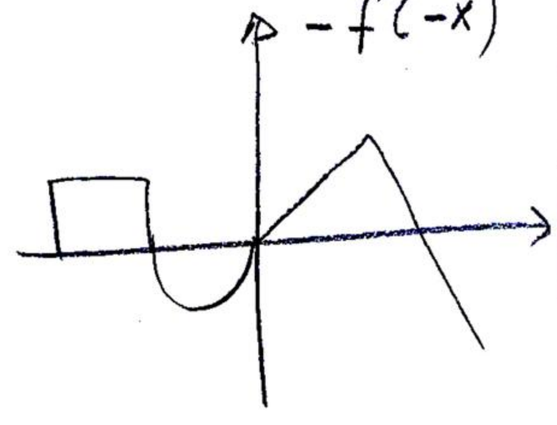
+

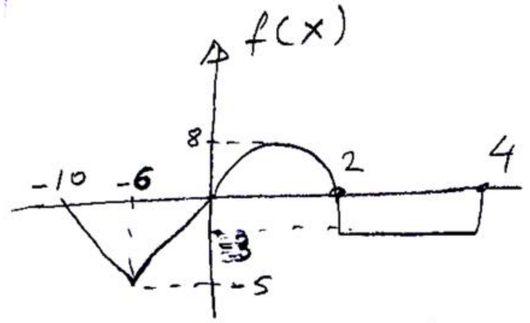

y
y = x³ - x
-1
+1

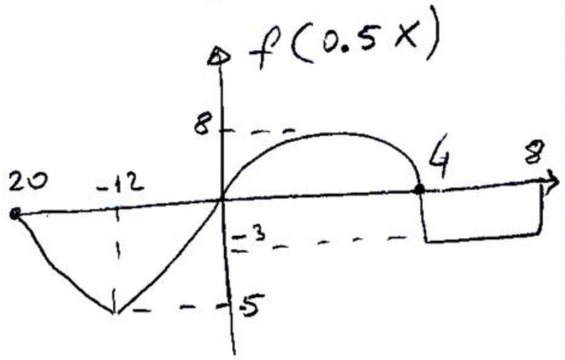

f(x)
10
-1
5
-2
-2
4
-3

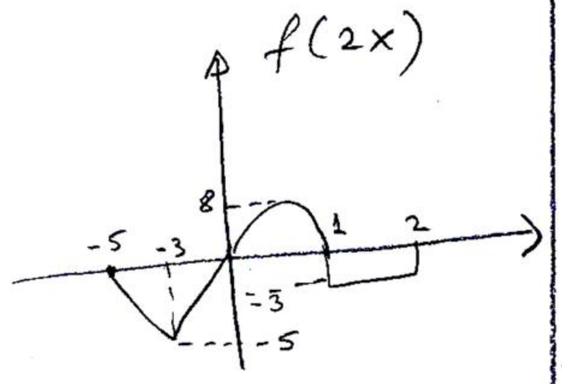

f(-x)
10
-5
-4
1
2
x
-2
-3

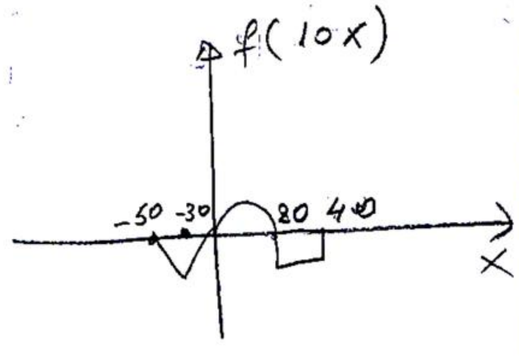

-f(x)
3
2
-2
-1
-10

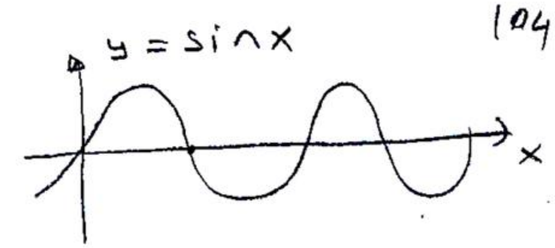

-f(-x)

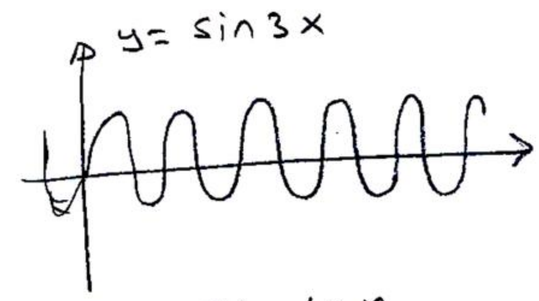

f(x)
8
-10
-6
2
4
-3
-5

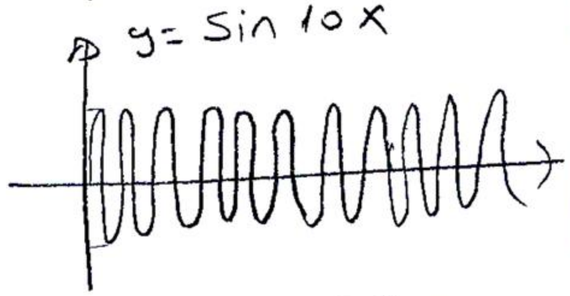

f(0.5x)
8
20
-12
4
8
-3
-5

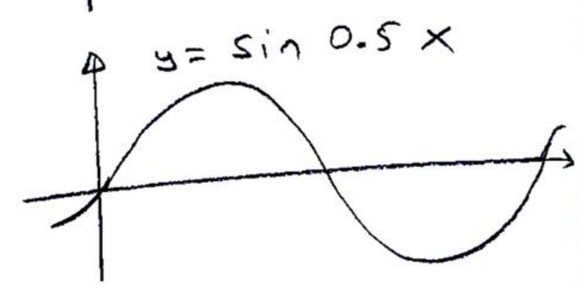

f(2x)
8
-5
-3
1
2
-3
-5


f(10x)
-50
-30
80
400
x

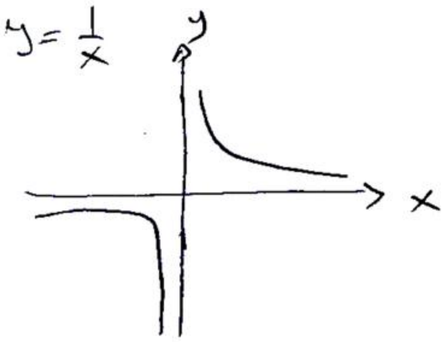

y = sin x
x


y = sin 3x

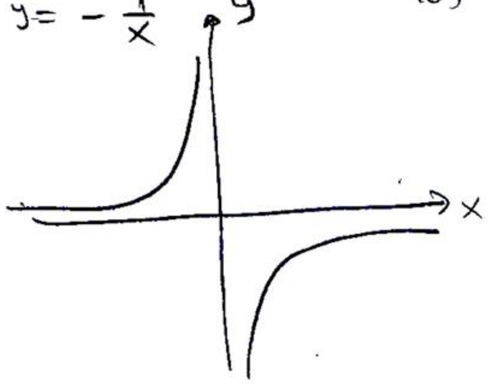

y = Sin 10x


y = Sin 0.5 x

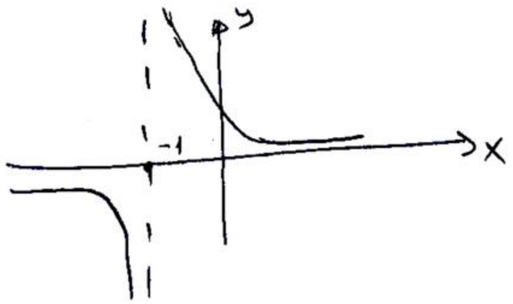
$y = \frac{1}{x}$



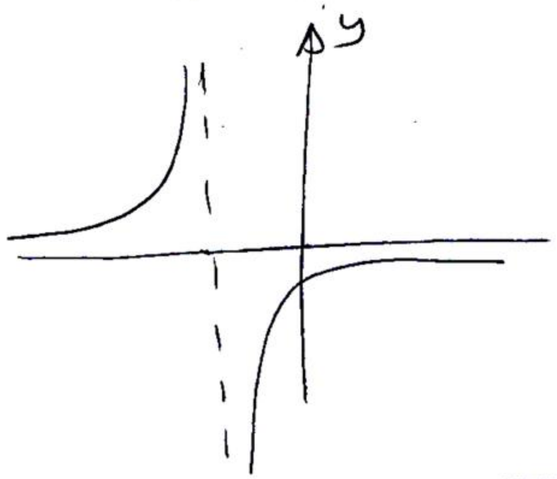
$y = -\frac{1}{x}$



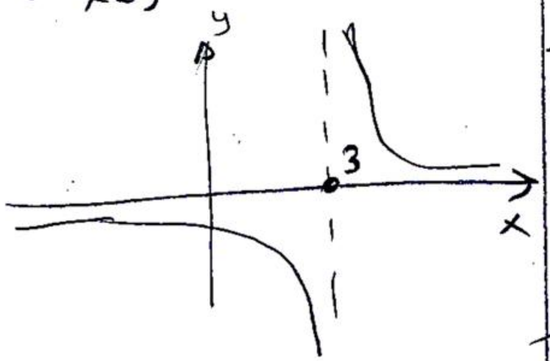
$y = \frac{1}{x+1}$



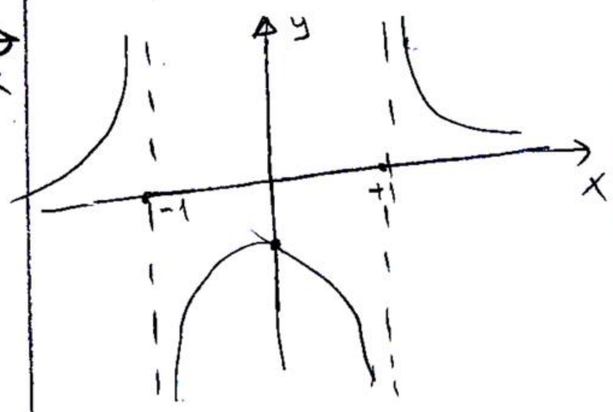
$y = -\frac{1}{x+5}$



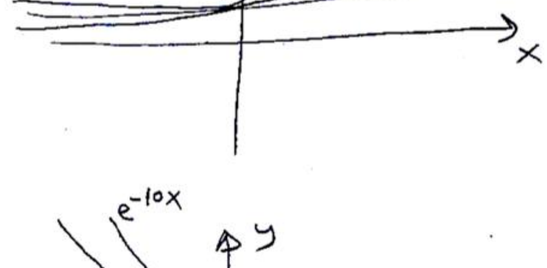
$y = \frac{1}{x-3}$

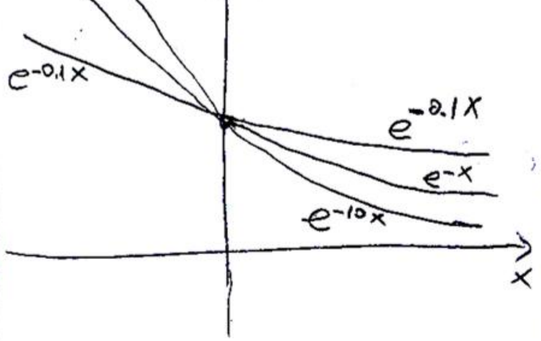


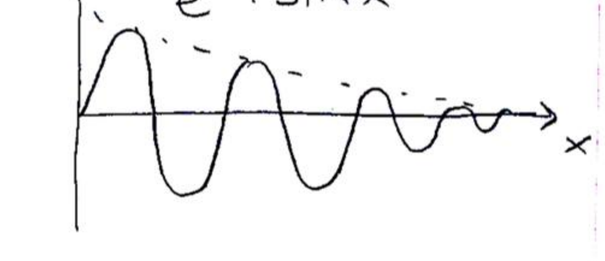
$y = \frac{1}{(x-1)(x+1)}$

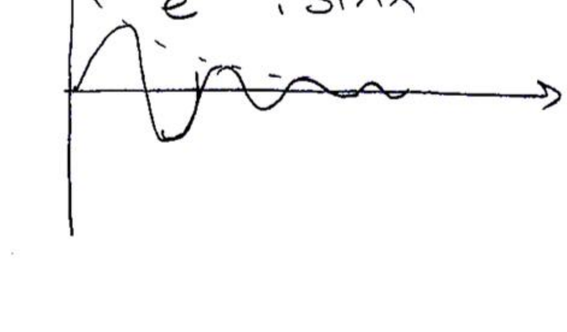


mühim Grafikler

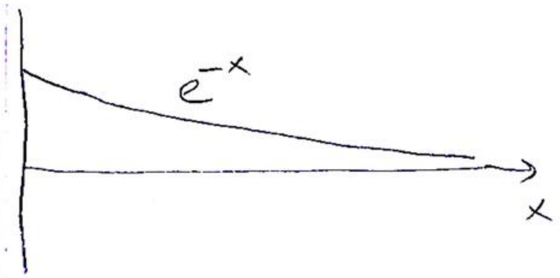




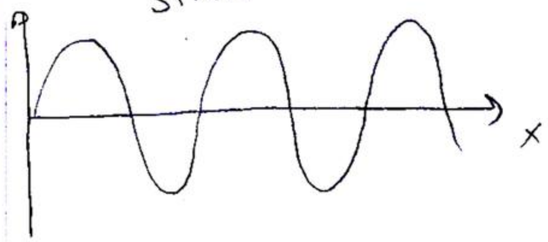




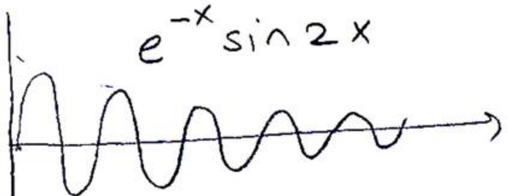
e^{-x}



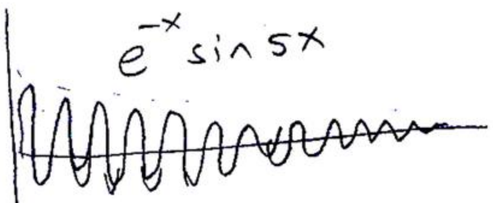
$\sin x$



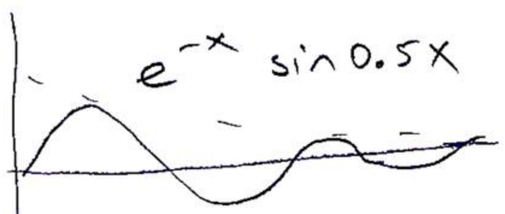
$e^{-x}\sin 2x$



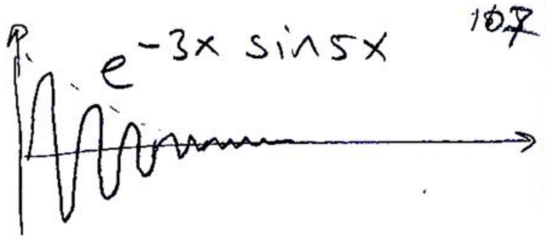
$e^{-x}\sin 5x$



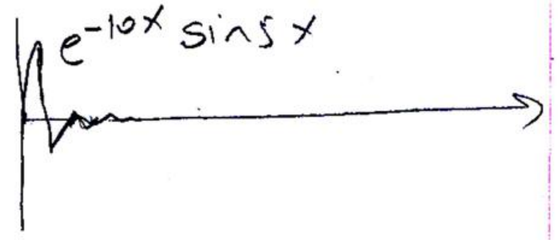
$e^{-x}\sin 0.5x$



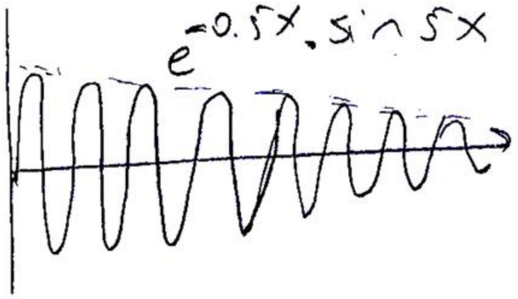
$e^{-3x}\sin 5x$



$e^{-10x}\sin 5x$

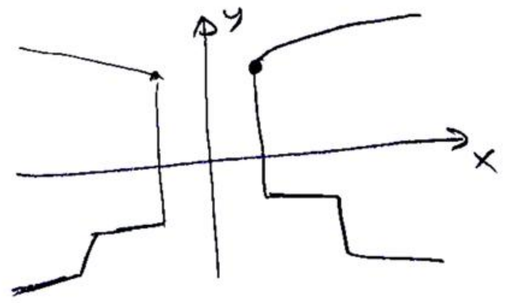


$e^{-0.5x}\cdot\sin 5x$



Simetri

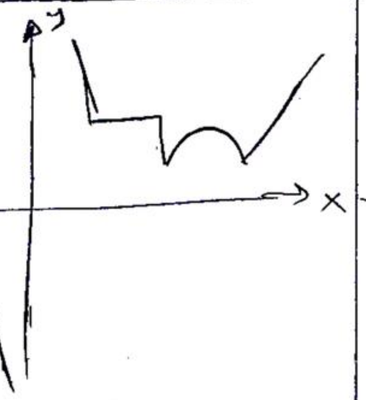
Tek ve çift fonksiyonlar



y eksenine göre

Simetrik

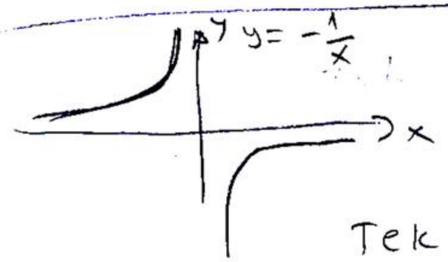
$y=f(x)$ çiftdir



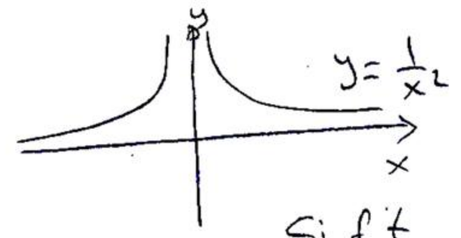
Orijine göre

Simetriktir

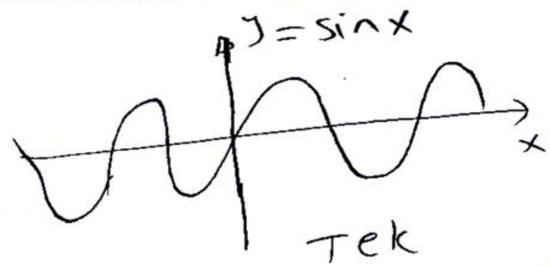
$y=f(x)$ tekdir.



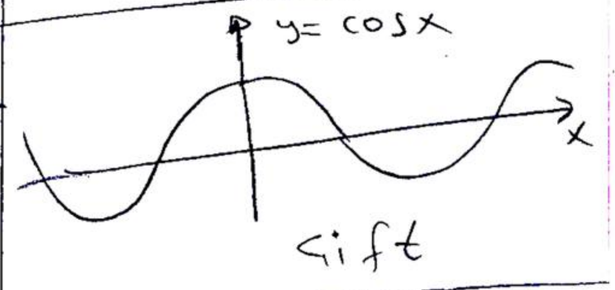
Tek



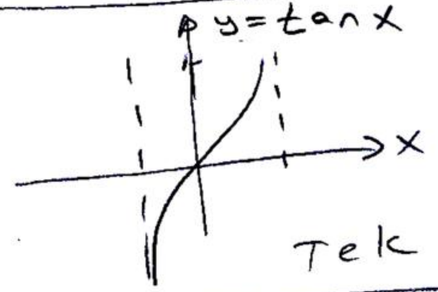
Çift



Tek

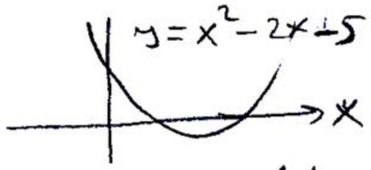


Çift



Tek

Bir fonksiyon tek ya da çift olmak zorunda değildir.



ne tek ne çift

P402

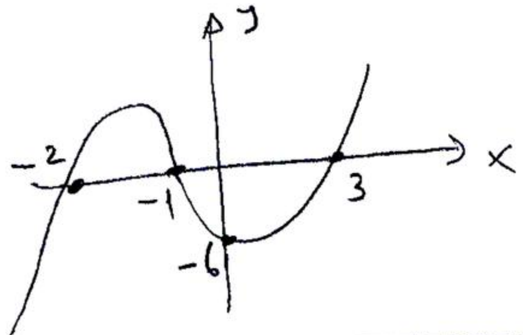
$y = x^3 - 7x - 6$ nın grafiğini çizin.

$x^3 - 7x - 6 = 0$ ın kökleri

$x_1 = 3$

$x_2 = -2$

$x_3 = -1$



P403

$y = x^4 + 4x^3 - 7x^2 - 22x + 24$ grafiğini çizin.

$x^4 + 4x^3 - 7x^2 - 22x + 24 = 0$

kökler

$x_1 = -4$

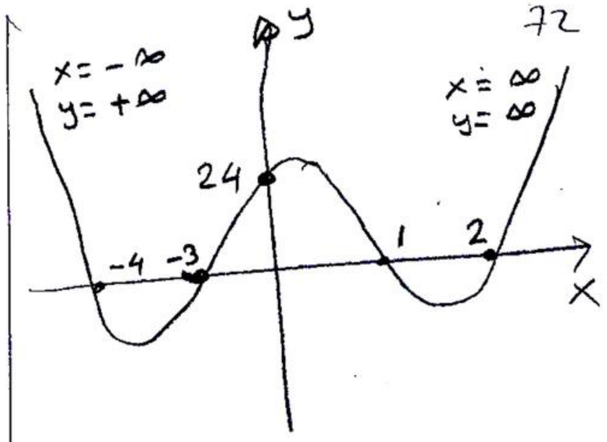
$x_2 = -3$

$x_3 = 1$

$x_4 = 2$

$x = \infty$ için $y = +\infty$

$x = -\infty$ için $y = +\infty$



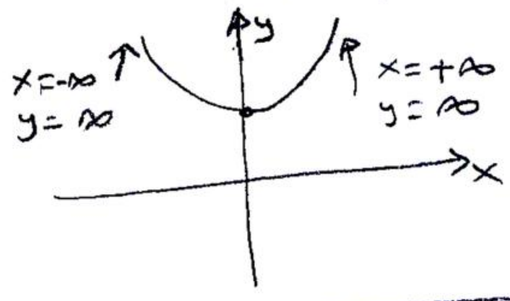
P. 404

$y = x^2 + 4$ grafiğini çizin

$x^2 + 4 = 0$

Kökler yoktur

x ekseni Kesmez

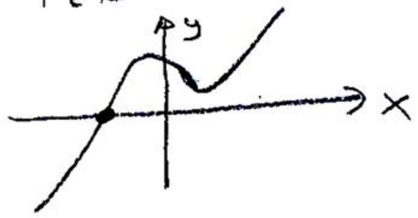


P405

$y = x^3 + x^2 + 4x + 4$

$x^3 + x^2 + 4x + 4 = 0$

Tek kök var $x = -1$

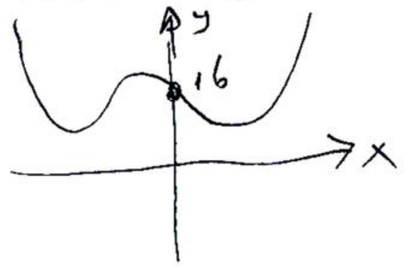


Pr. 406

$y = x^4 + x^2 + 16$ grafiğini çizin

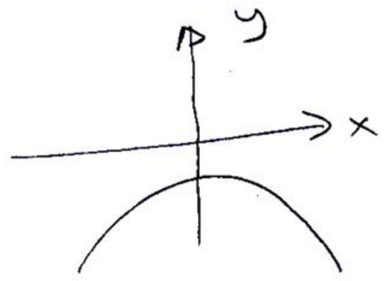
$x^4 + x^2 + 16 = 0$

Kök yoktur.



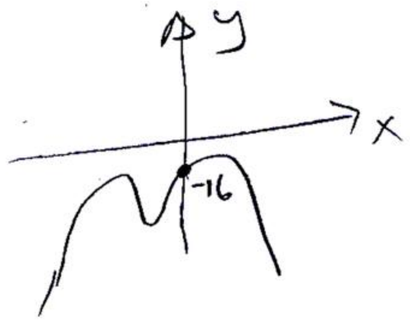
Pr 407

$y = -x^2 - 4$



Pr 408

$y = -x^4 - x^2 - 16$



Pr. 409

$y = -x^3 + 1$

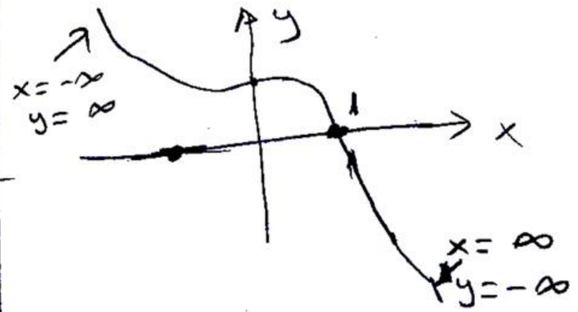
$-x^3 + 1 = 0$

Tek kök var

$x = 1$

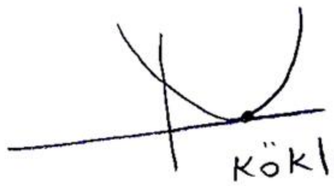
$x = -\infty \rightarrow y = +\infty$

$x = +\infty \rightarrow y = -\infty$



Pr 410

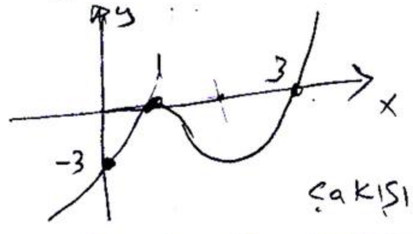
$y = x^2 - 2x + 1$ $x_1 = 1$ $x_2 = 1$



Kökler eşit çakışık kök

Pr 411

$y = x^3 - 5x^2 + 7x - 3$



$x_1 = 1$

$x_2 = 1$

$x_3 = 3$

çakışık kök

Eşitsizlikler

(51) $x+1>3$

$x>3-2$

$x>1$

(52) $2x+5>x+8$

$2x-x>8-5$

$x>3$

(53) $2x\geq 8$

$\frac{2x}{4} \geq \frac{8}{4}$

$x\geq 2$

(54) $-2x>8$

$\frac{-2x}{-2} < \frac{8}{-2}$

$\boxed{x<-4}$

Eşitsizliğin 80

İki tarafı negatif bir sayıya bölünürse eşitsizlik yön değiştirir.

$-x>8$

$x<-8$

Mutlak Değer

$f(x)=|g(x)|$

Bu eşitliğin tanımı şöyle olacaktır

Eğer $g(x)\geq$ ise $f(x)=g(x)$

Eğer $g(x)<0$ ise $f(x)=-g(x)$

Problem 56

$3x+2=|x+4|$

denklemini sağlayan x değerlerini bulun

Çözüm

$x+4>0$ için

$3x+2=x+4$

denklemini çözmeliyiz

$x+4<0$ için 81

$3x+2=-(x+4)$

denklemini çözmeliyiz

a) $x+4\geq 0$ için

$3x+2=x+4$

$2x=-2+4$

$\boxed{x=1}$

b) $x+4<0$ için

$3x+2=-x-4$

$4x=-6$

$x=-\frac{6}{4}=-1.5$

Dikkat

Biz $x+4<0 \Rightarrow x<-4$

Varsaydık $x=-1.5$

bulduk $-1.5<-4$

$-1.5 < -4$

yanlış olduğundan bulduğumuz çözüm yanlıştır yani $x = -1.5$ çözüm değildir.

Problemin sadece bir çözümü vardır

$x = 1$

gerçekten.

$3x + 2 = |x + 4|$

$3 \cdot 1 + 2 = |1 + 4|$

$5 = 5$,

$x = -1.5$ için

$3x + 2 = |x + 4|$

$3 \cdot (-1.5) + 2 = |-1.5 + 4|$

$-2.5 = 2.5$

$x = -1.5$ ~~çözüm~~ değil

P57

$2x + 4 = |-4x + 3|$

① $-4x + 3 > 0$ için

yani $-4x > -3$

$x < \frac{3}{4}$ için

$x < 0.75$

$2x + 4 = -4x + 3$

$2x + 4x = -4 + 3$

$6x = -1$

$x = -0.166$

$x < 0.75$ kabulü yaptık.

$x = -0.66$ bulduk

$-0.66 < 0.75$

olduğundan bulduğumuz çözüm doğru

② $-4x + 3 < 0$ için

yani $-4x < -3$

$x > \frac{3}{4}$

$x > 0.75$

için

$2x + 4 = -(-4x + 3)$

$2x + 4 = 4x - 3$

$2x - 4x = -3 - 4$

$-2x = -7$

$x = 3.5$

$x > 0.75$ kabulü yaptık

$x = 3.5$ bulduk

çözüm doğru

Kontrol

$2x + 4 = |-4x + 3|$

denkleminin çözümleri

$x = -0.166$

$x = 3.5$

$x = -0.1666$ 'koyalım

$2x + 4 = |-4x + 3|$

$2(-0.166) + 4 = |-4(-0.166) + 3|$

$3.66 = 3.66$

$x = 3.5$ koyalım.

$2x + 4 = |-4x + 3|$

$2 \cdot 3.5 + 4 = |-4 \cdot 3.5 + 3|$

$11 = |-11|$

$11 = 11$

çözümler doğru.

Problem 218)

$|x| < 3$ eşitsizliğini sağlayan x değerlerini bulun.

çözüm $-3 < x < 3$

P. 219

$|x+2| < 3$ $x = ?$

çözüm

$-3 < x+2 < 3$

Burada 2 eşitsizlik var

$-3 < x+2 \rightarrow x > -5$

$x+2 < 3 \rightarrow x < 1$

sonuç

$-5 < x < 1$ olmalı

Kontrol

$x = -6$ için

$|-6+2| < 3$

$4 < 3$ yanlış

çıkmalı idi yanlış çıktı o halde çözümümüz doğru

$x = -1$ için

$|-1+2| < 3$

$1 < 3$ ✓

doğru çıkmalı idi doğru çıktı işlemimiz doğru

$x = 5$ için

$|5+2| < 3$

$7 < 3$

yanlış çıkmalı idi yanlış çıktı

---

2. çözüm yolu

$f(x) = |x+2|$

$f(x) < 3$

mutlak değer fonksiyonu. tanım

$$f(x) = \begin{cases} x+2 & x+2 > 0 \text{ ise} \\ -(x+2) & x+2 < 0 \text{ ise} \end{cases}$$

o halde $x+2 > 0$ yani $x > -2$ için fonksiyonun değeri $f(x) = x+2$ dir.

$x+2 < 0$ için yani $x < -2$ için fonksiyonun değeri $-(x+2)$ dir.

Bu durumda

fonksiyonu iki ayrı bölgede ayrı ayrı inceleriz.

$-\infty < x < -2$ için

$f(x) = -x-2$

$f(x) < 3$

$-x-2 < 3$

$x > -5$

$-2 < x < \infty$ için

$f(x) = x+2$

$f(x) < 3$

$x+2 < 3$

$x < 1$

iki şart birleştirilirse

$-5 < x < -1$

Problem 220

$|x+1| > |x+2|$

eşitsizliğini sağlayan x'leri bulun.

çözüm:

$f(x) = |x+1|$

$g(x) = |x+2|$

$f(x) > g(x)$

şeklinde düşünürüz

$$f(x) = \begin{cases} x+1 & x > -1 \\ -(x+1) & x < -1 \end{cases}$$

$$g(x) = \begin{cases} x+2 & x > -2 \\ -(x+2) & x < -2 \end{cases}$$

x	$-\infty$	-2	-1	∞
f(x)	$-x-1$			$x+1$
g(x)	$-x-2$		$x+2$	

3 bölge var

$-\infty, -2$ arası

$-2, -1$ arası

$-1, \infty$ arası

$-\infty < x < -2$ arası

$f(x) = -x - 1$

$g(x) = -x - 2$

$f(x) > g(x)$

$-x - 1 > -x - 2$

$-1 > -2$

$-\infty < x < -2$ arasında daima sağlanır.

$-2 < x < -1$ arası

$f(x) = -x - 1$

$g(x) = x + 2$

$f(x) > g(x)$

$-x - 1 > x + 2$

$2x < -3$

$x < -1.5$

$-2 < x < -1$ varsaydık

$x < -1.5$ çıktı

sonuç

$-2 < x < -1.5$ olmalı.

$-1 < x < \infty$ arası

$f(x) = x + 1$

$g(x) = x + 2$

$f(x) > g(x)$

$x + 1 > x + 2$

$1 > 2$

$-1 < x < \infty$ arası hiç bir zaman sağlanmaz.

Sonuç

$-\infty < x < -2$ bütün x ler

$-2 < x < -1$ $-2 < x < -1.5$

$-1 < x < \infty$ hiçbir x

birleştirirsek

$-\infty < x < -1.5$ aralarında $|x+1| > |x+2|$ sağlanır.

Kontrol:

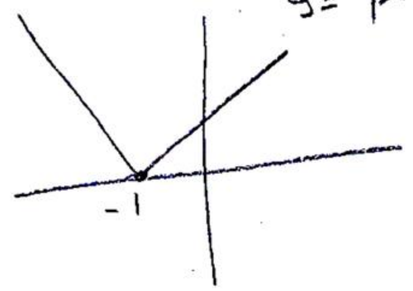
$x = -20$

$|-20+1| > |-20+2|$

$19 > 18$ doğru.

$y = |x+1|$

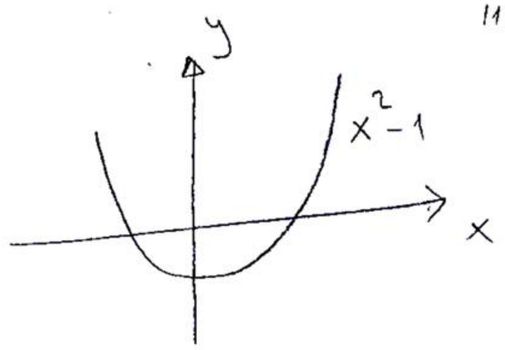
x	x+1	|x+1|
-100	-99	99
-3	-2	2
-1	0	0
0	1	1
10	11	11

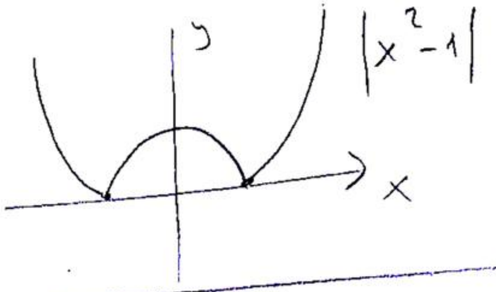


$y = |x^2 - 1|$ grafiğini çizin.

$z = x^2 - 1$ i çizin.

fonksiyonun - kısımlarını + yapın





Problem 211

$|x^2 - 1| < 3$

x in alabileceği değerleri bulun.

Çözüm:

Bir A sayısı için $|A| \leq 3$ denilirse

$-3 \leq A \leq 3$ olacak

demektir.

$-3 < x^2 - 1 < 3$

olmalıdır.

Burada 2 eşitsizlik vardır.

a) $-3 < x^2 - 1$

$-3+1 < x^2$

$x^2 + 2 > 0$ (Her zaman sağlanır)

b) $x^2 - 1 < 3$

$x^2 < 4$

$-2 < x < 2$

Bütün şartları sağlayan bolse

$-2 < x < 2$

bu bölge hem a) hem b) şıkkını sağlar.

---

2. çözüm yolu

$|x^2 - 1| = f(x)$

$f(x) < 3$

$x^2 - 1 \geq 0$ ise $f(x) = x^2 - 1$

$x^2 - 1 < 0$ ise $f(x) = -(x^2 - 1)$

$x^2 - 1 \geq 0 \rightarrow x^2 \geq 1 \rightarrow x \geq 1$ veya $x \leq -1$

$x^2 - 1 < 0 \rightarrow x^2 < 1 \Rightarrow x < 1$ ve $x > -1$

o halde

$$f(x) = \begin{cases} x^2 - 1 & x \geq 1 \text{ veya } x \leq -1 \\ 1 - x^2 & -1 < x < 1 \end{cases}$$

	$-\infty$		-1		$+1$		$+\infty$
x							
$f(x)$	x^2-1		$1-x^2$		x^2-1		

şimdi $f(x) < 3$ şartını sağlayan x leri bulmaya çalışalım.

$-\infty$ -1 arasında

$f(x) = x^2 - 1$

$x^2 - 1 < 3$

$x^2 < 4$

$-2 < x < 2$

$-\infty$, -1 arası bir sayı idi

-2 $+2$ arası bulduk

$\begin{pmatrix} -\infty < x < -1 \\ -2 < x < 2 \end{pmatrix}$ her iki şartı sağlayan

aa) $\boxed{-2 < x < -1}$ dir.

---

1 $+\infty$ arasında

$f(x) = x^2 - 1$

$x^2 - 1 < 3$

$\begin{pmatrix} -2 < x < 2 \\ 1 < x < \infty \end{pmatrix}$ her iki şartı sağlayan

ab) $\boxed{1 < x < 2}$

$-1 < x < 1$ için

$f(x) = 1 - x^2$

$1 - x^2 < 3$

$1 - 3 < x^2$

$x^2 + 2 > 0$

$x^2 > -2$

$x^2 + 2 > 0$ her zaman sağlanır.

o halde $-1 < x < 1$ olduğu sürece temel şart daima sağlanır.

3 şartı birleştirelim

$-2 < x < -1$

$1 < x < 2$

$-1 < x < 1$

sonuçda $\boxed{-2 < x < 2}$ olduğu sürece

$|x^2 - 1| < 3$ olacaktır.

$|x+5| + |x-1| < 11$

eşitsizliğini sağlayan x değerlerini bulun.

Çözüm:

$f_1(x) = |x+5|$

$g(x) = |x-1|$

mutlak değer tanımı

$$f(x) = \begin{cases} x+5 \to x+5 > 0 & x > -5 \\ -(x+5) \to x+5 < 0 & x < -5 \end{cases}$$

Yani $x > -5$ ise

$f(x) = x+5$ alacağız

$x < -5$ ise

$f(x) = -x-5$ alacağız.

$$g(x) = |x-1|$$

$$g(x) = \begin{cases} x-1 & x > 1 \\ 1-x & x < 1 \end{cases}$$

Bütün bu şartları tek tek incelememiz lazım.

x	$-\infty$		-5		1		$+\infty$
$f(x)$	$-x-5$			$x+5$			
$g(x)$	$1-x$					$x+1$	

$-\infty, -5$ arasını

$-5, 1$ arasını

$1, \infty$ arasını

ayrı ayrı incelememiz gerekir.

$-\infty < x < -5$ arası

$f(x) + g(x) < 11$

$-x-5 + 1-x < 11$

$-2x - 4 < 11$

$2x > -15$

$x > -7.5$

$-\infty < x < -5$ olduğunu varsaydık

$x > -7.5$ bulduk

$-7.5 < x < -5$ olmalı

yani $-\infty < x < -5$ için

$f(x) + g(x) < 11$

şartını sağlayan

$-7.5 < x < -5$

$-5 < x < 1$ arasında

$f(x) + g(x) < 11$

$x + 5 + 1 - x < 11$

$6 < 11$

$-5 < x < 1$ arasında

$f(x) + g(x) < 11$

daima sağlanır.

$1 < x < \infty$ için

$f(x) + g(x) < 11$

$x + 5 + x - 1 < 11$

$2x + 4 < 11$

$2x < 7$

$x < 3.5$

$1 < x < \infty$ arasında

$x < 3.5$ olduğu

zaman şart sağlanır

$1 < x < 3.5$ olmalı

$1 < x < \infty$ varsaydık

$x < 3.5$ çıktı

yani $1 < x < 3.5$ olmalı

Sonuç

$f(x) + g(x) < 11$

olması için

$-\infty < x < -5$ $\quad -7.5 < x < -5$

$-5 < x < 1$ $\quad$ bütün $x$ler

$1 < x < \infty$ $\quad 1 < x < 3.5$

Birleştirirsek

$-7.5 < x < -5$

$-5 < x < 1$

$1 < x < 3.5$

veya

$-7.5 < x < 3.5$

Kontrol

$|x+5| + |x-1| < 11$

$x = -6$

$|-6+5| + |-6-1| < 11$

$1 + 7 < 11$

$8 < 11$ ✓

$x = -8$

$|-8+5| + |-8-1| < 11$

$3 + 9 < 11$

$12 < 11$ ✗

$x = 3$

$|3+5| + |3-1| < 11$

$8 + 2 < 11$

$10 < 11$ ✓

$x = 4$

$|4+5| + |4-1| < 11$

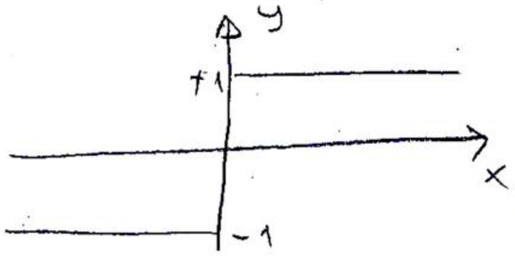
$9 + 3 < 11$

$12 < 11$ ✓

Problem 311

$y = \operatorname{sgn}(x)$ çizin

Çözüm



Problem 312

$y = \operatorname{sgn}(x-1)$ çizin.

Çözüm

$f(x) = x - 1$

$y = \operatorname{sgn}(f(x))$

şeklinde düşünüp

$f(x)$ ne zaman $+$, ne zaman $(-)$ onu bulmalıyız.

$f(x) = x - 1 > 0$

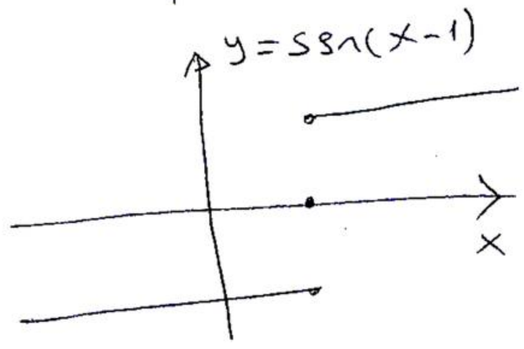
$x - 1 > 0$

$x > 1$

$x > 1$ için $f(x)$ +

$x < 1$ için $f(x)$ −

x	$-\infty$		1		∞
$f(x)$	−	−	0	+	+
$\operatorname{sgn}(f(x))$	−1	−1		+1	+1



fonksiyonların işaretleri. işaret tabloları

P 301

$y = f(x) = x + 1$

veriliyor.

$f(x) > 0$ ve $f(x) < 0$ olan bölgeleri bulun.

$f(x) = x + 1 > 0 \Rightarrow x > -1$

$x > -1$ için $f(x) > 0$

$x < -1$ için $f(x) < 0$

x	$-\infty$		-1		$+\infty$
$f(x)$	−	−	0	+	+

(P302) $f(x) = -2x + 10$

$f(x) > 0$ ve $f(x) < 0$ olan bölgeleri bulun

$-2x + 10 > 0$

$-2x > -10$

$x < 5$

$x < 5$ için $f(x) > 0$

$x > 5$ için $f(x) < 0$

x	$-\infty$		5		$+\infty$
$f(x)$	+	+	0	−	−

(P303)

$f(x) = (x+1)(-2x+10)$

$f(x) > 0$ ve $f(x) < 0$ olan bölgeleri bulun

Önceki problemlerden

x	$-\infty$		-1		5		$+\infty$
$x+1$	−	−	0	+	+	+	+
$-2x+10$	+	+	+	+	0	−	−
$(x+1)(-2x+10)$	−	−	0	+	0	−	−

$(x+1)$ ve $(-2x+10)$ satırlarının işaretini çarparak en alt satır işaretlerini elde ettik.

o halde

$-\infty < x < -1$ için $f(x) < 0$

$-1 < x < 5$ için $f(x) > 0$

$5 < x < \infty$ için $f(x) < 0$

P304

$f(x) = (x+1)(x+2)(x+10)$

işaretini inceleyin.

x	$-\infty$		-10		-2		-1		$+\infty$
$x+1$		$-$		$-$		$-$		$++$	
$x+2$		$-$		$-$		$+$		$++$	
$x+10$	$-$		$+$		$+$		$+$		
$f(x)$	$-$		$+$		$-$		$+$		

$-\infty < x < -10$ $\quad f(x) < 0$

$-10 < x < -2$ $\quad f(x) > 0$

$-2 < x < -1$ $\quad f(x) < 0$

$-1 < x < \infty$ $\quad f(x) > 0$

305

$f(x) = \dfrac{(x+1)(x+2)}{x+10}$

işaretini inceleyin.

$(-)\times(-) = (+)$

$\dfrac{(-)}{(-)} = +$

$(-)\times(+) = -$

$\dfrac{(-)}{(+)} = -$

işaretlerin bölümü ve çarpımı aynı sonucu verir. o halde bu problem önceki problem ile aynı sonucu verir yani

$-\infty < x < -10$ $\quad f(x) > 0$

$-10 < x < -2$ $\quad f(x) < 0$

$-2 < x < -1$ $\quad f(x) > 0$

$-1 < x < \infty$ $\quad f(x) < 0$

olacaktır.

(p306) $f(x) = x(x+5)$

x	$-\infty$		-5		0		∞
x	$-$	$-$		$-$	0	$+++$	
$x+5$	$-$	$--$		$++$		$+++$	
$f(x)$	$++$		$--$		$+++$		

$-\infty < x < -5$ $\quad f(x) > 0$

$-5 < x < 0$ $\quad f(x) < 0$

$5 < x < \infty$ $\quad f(x) > 0$

P307.

$f(x) = (x+2)\ln x$

işaretini inceleyin.

x	$-\infty$		0		1		2		∞
x	$-$	$-$		$+$		$+$		$+$	
$\ln x$	Tanımsız		$-$		$+$		$+$		

$-\infty < x < 0$ $\quad f(x)$ tanımsız

$0 < x < 1$ $\quad f(x) < 0$

$1 < x < \infty$ $\quad f(x) > 0$

P. 308

$f(x) = \sqrt{\dfrac{x+1}{x-1}}$

fonksiyonun tanımlı olduğu bölgeyi bulun

Karekök fonksiyonu pozitif değerler için tanımlıdır.

$\dfrac{x+1}{x-1}$ pozitif olmalıdır.

x	$-\infty$		-1		$+1$		∞
$x+1$	$-$	$-$		$+$		$+$	
$x-1$	$-$		$-$		0	$+$	
$\dfrac{x+1}{x-1}$	$+$		$-$		$+$		

$-\infty < x \leq -1$ $\quad f(x)$ tanımlı

$-1 < x \leq +1$ $\quad f(x)$ tanımsız

$1 < x < \infty$ $\quad f(x)$ tanımlı

P. 309

$f(x) = \sqrt{\dfrac{x^2+5x+6}{x^2-16}} = \sqrt{h(x)}$

$f(x)$ in tanımlı olduğu bölgeyi bulun

$x^2+5x+6 = (x+2)(x+3)$

$x^2-16 = (x-4)(x+4)$

x	$-\infty$		-4		-3		-2		4		$+\infty$
$x+2$	$-$	$-$		$-$		$-$		$+$		$+$	
$x+3$	$-$	$-$		$-$		$+$		$+$		$+$	
$x+4$	$-$		$+$		$+$		$+$		$+$		
$x-4$	$-$		$-$		$-$		$-$		0	$+$	
$h(x)$	$+$		$-$		$+$		$-$		$+$		
$f(x)$	Tanımlı		XX		Tanımlı		XX		Tanımlı		

P 310

$f(x)=\sqrt{\frac{x^2+4}{x-1}}=\sqrt{h(x)}$

Tanımlı olduğu bölgeyi bulun.

x	$-\infty$		1		$+\infty$
x^2+4	+	+	+	+	+
$x-1$	−	−	−	+	+
$h(x)$	−	−	‖	+	+
$f(x)$	tanımsız		‖	Tanımlı	

$-\infty<x<1$ $f(x)$ tanımsız

$1<x<\infty$ $f(x)$ tanımlı

Kontrol

$x=-5$ için $(x<1)$

$\sqrt{\frac{(-5)^2+4}{-5-1}}=\sqrt{-\frac{29}{6}}$ → Tanımsız

$x=2$ için $x>1$

$\sqrt{\frac{2^2+4}{2-1}}=\sqrt{\frac{8}{1}}$ → tanımlı

Not:

$f(x)=x^2+bx+c$

$x^2+bx+c=0$ nin kökler yoksa işaret devamlı (+) dır

$f(x)=-x^2+bx+c$

$-x^2+bx+c=0$

Kökler yoksa işaret devamlı (−) dir

$f(x)=x^2+bx+c$

$x^2+bx+c=0$

Kökler varsa

x	$-\infty$		x_1		x_2	$+\infty$
x^2+bx+c	+	+	‖	−	+	+

iki kök arası işaret (−) dir

diğer yerlerde (+) dır

P(311) $f(x)=x^2+5x+6$

$=(x+2)(x+3)$

x	$-\infty$		-3		-2	$+\infty$
$x+2$	−	−	‖	−	+	+
$x+3$	−	−	‖	+	+	+
$f(x)$	+	+	‖	−	+	+

Kökler arası (−)

P313

$f(x)=\frac{x^2+2x+5}{(x-2)(x+8)}$

işaretini inceleyin.

$x^2+2x+5=0$ ın köklerini bulalım.

$\Delta=b^2-4ac$

$=2^2-4\times1\times5$

$=-16$

$\Delta<0$ kökler yok

O halde x^2+2x+5 in işareti her yerde (+) dır.

x	$-\infty$		-8		2	$+\infty$
x^2+2x+5	+	+	+	+	+	+
$x-2$	−	−	−	+	+	+
$x+8$	−	−	+	+	+	+
$f(x)$	+	‖	−	‖	+	+

Sonuç;

$-\infty<x<-8$ $f(x)>0$

$-8<x<2$ $f(x)<0$

$2<x<\infty$ $f(x)>0$

P 321

$f(x)=\frac{(x+1)(x-3)}{(x-2)(x+10)}>0$

eşitsizliğini sağlayan x değerlerini bulu

x	$-\infty$		-10		-1		2		3	+
$x+1$	−	−	−	−	‖	+	+	+	+	+
$x-3$	−	−	−	−	−	−	−	−	‖	+
$x+10$	−	−	‖	+	+	+	+	+	+	+
$x-2$	−	−	−	−	−	−	‖	+	+	+
$f(x)$	+	‖	−	‖	+	‖	−	‖	+	+

$f(x)>0$ olduğu yerler

$-\infty<x<-10$

$-1<x<2$

$3<x<\infty$

Bu bölgelerde $f(x)>0$ dır.