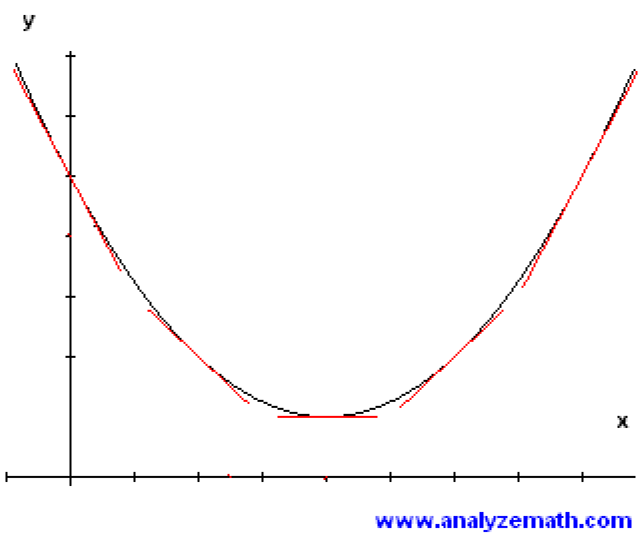
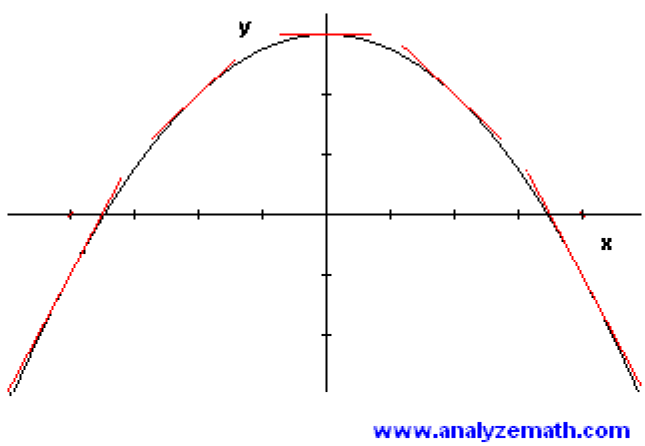
Concavity

Concave Up: A graph or part of a graph which looks like a right-side up bowl or part of an right-side up bowl.



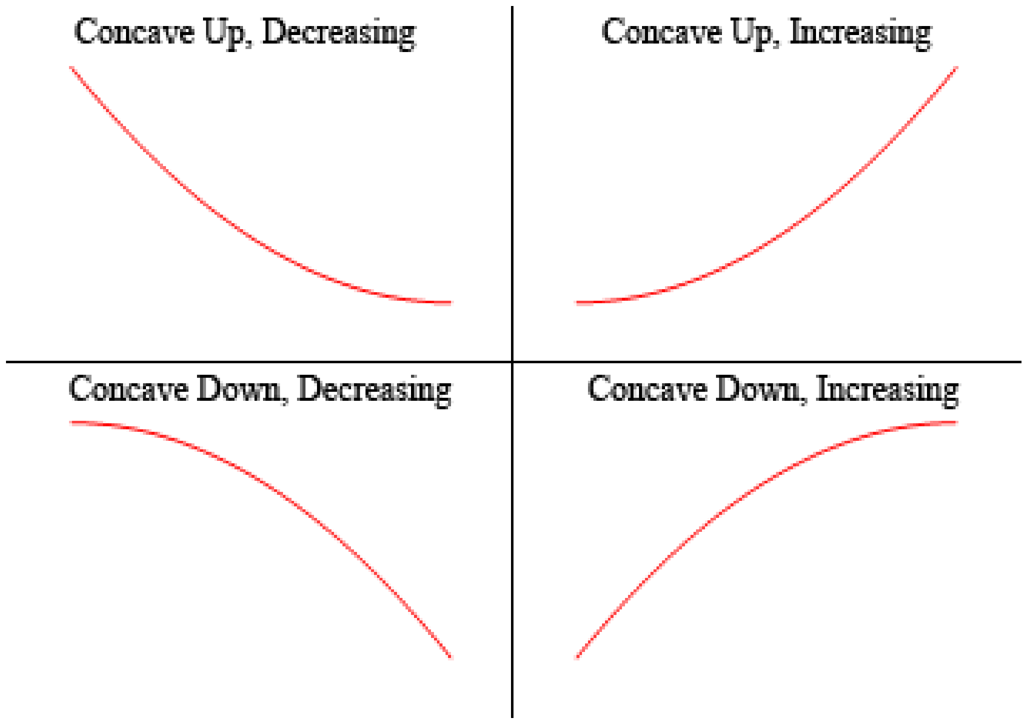
Remember: Concave Up behaves like U

Concave Down: A graph or part of a graph which looks like an upside-down bowl or part of an upside-down bowl.

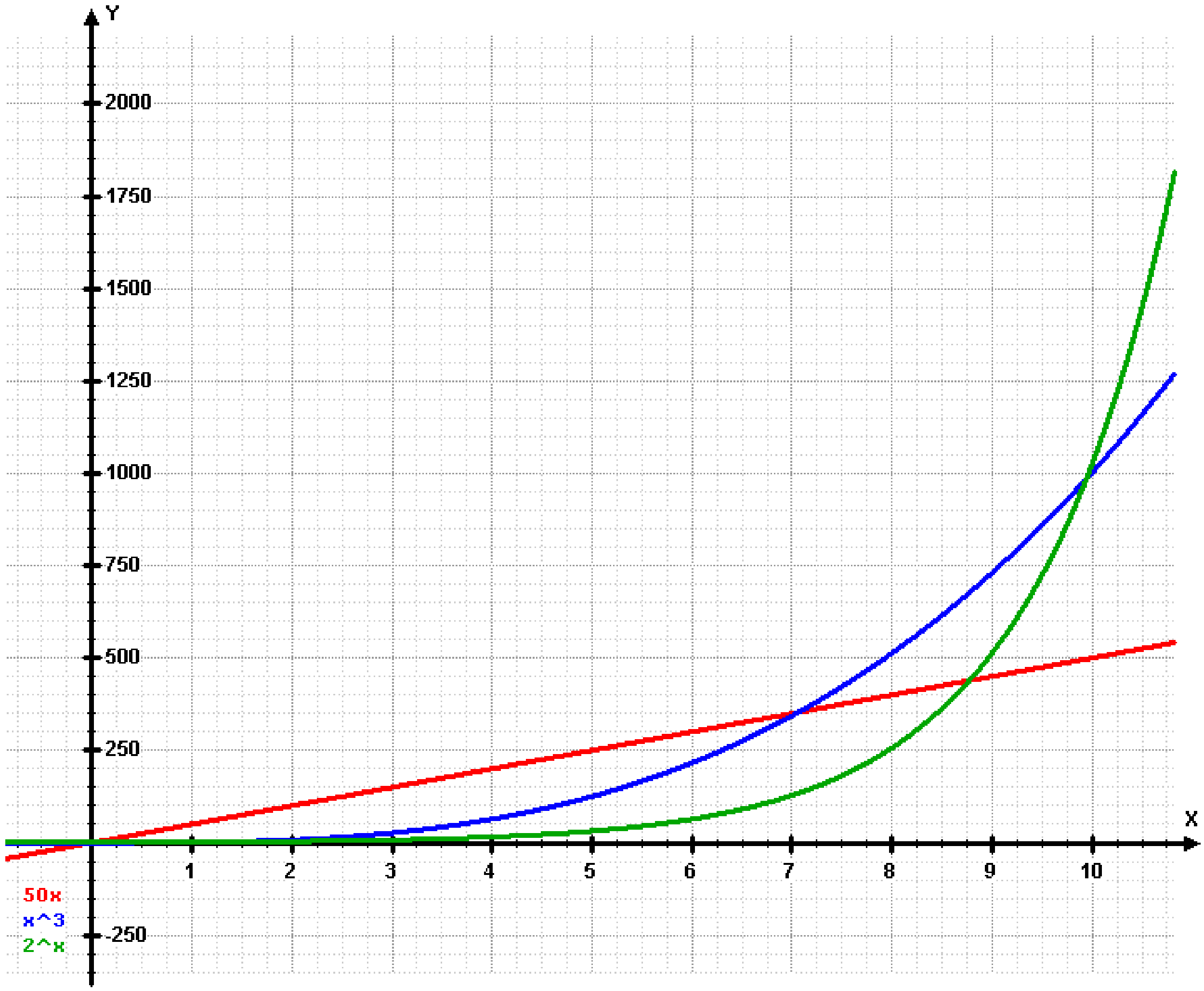


Remember: Concave Down behaves like n

Types of intervals:



Section 1.5 Exponential Functions



$$P(t) = P_0 a^t$$

P_0

Initial value

y-intercept

$P(0) = P_0$

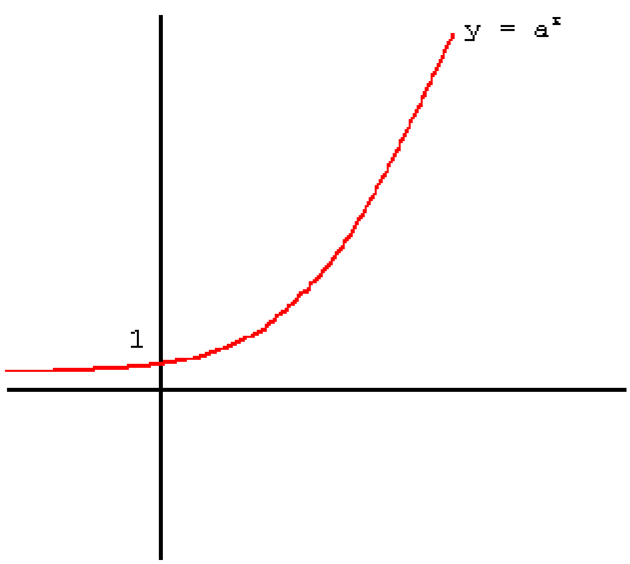
a

Tells us how much the function grows

$a > 1$ Increasing

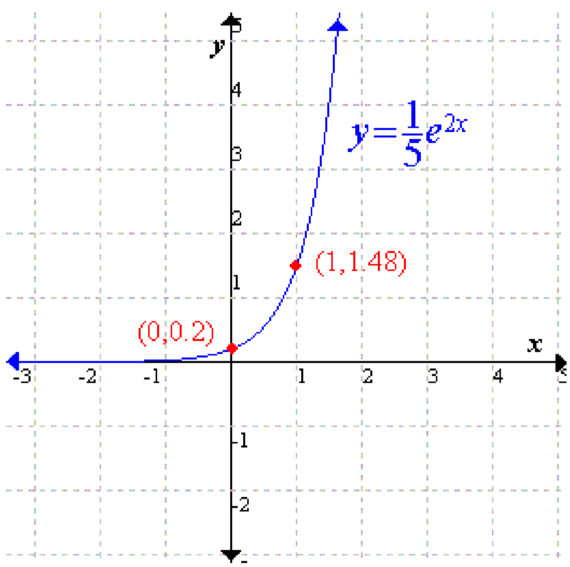
$a < 1$ Decreasing

$a > 1$



$$a = 1 + \frac{\%}{100}$$

$a < 1$



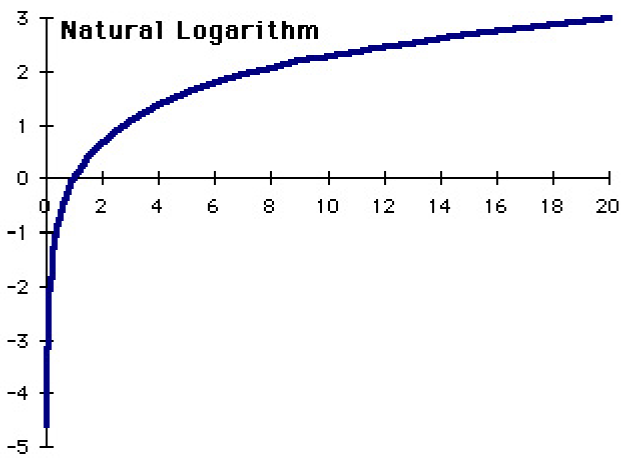
$$a = 1 - \frac{\%}{100}$$

Demographics of the US: http://en.wikipedia.org/wiki/Demographics_of_the_United_States

Exponential Functions: Functions in which the dependent variable (aka y, aka P(t)) always grows in the same percentage for every unit of the dependent variable(aka x , aka t)

SECTION 1.5 THE NATURAL LOGARITHM

the natural logarithm of a number *x* is the power to which *e* would have to be raised to equal *x*



$\ln 1 = 0$ because $e^0 = 1$

$\ln e = 1$ because $e^1 = e$

Also notice that since $\ln x$ and e^x are inverse functions, we have that

$$e^{\ln(x)} = x \qquad \text{if } x > 0$$
$$\ln(e^x) = x.$$

$$0 < x < 1 \Rightarrow -\infty < \ln x < 0$$
$$\ln 1 = 0$$
$$1 < x < \infty \Rightarrow 0 < \ln x < \infty$$

Domain and Range

$$\ln(xy) = \ln x + \ln y$$
$$\ln\left(\frac{x}{y}\right) = \ln x - \ln y$$

Multiplication and Division

$$\ln x^z = z \ln x$$
$$\ln x^{1/z} = \frac{1}{z}\ln x \quad (here \quad z \neq 0)$$

Exponentiation

Section 1.7 : Exponential Growth and Decay

$$P(t) = P_0 a^t \quad \Leftrightarrow \quad P(t) = P_0 e^{kt}$$

$$0 < a < 1 \quad \Leftrightarrow \quad k < 0$$

$$a > 1 \quad \Leftrightarrow \quad k > 0$$

$$a = e^k$$

Doubling time and Half-Life

$a > 1$

$a^{DT} = 2$

$a < 1$

$a^{HL} = \frac{1}{2}$

Section 1.8: New Functions From Old

Composed functions.

We can create a new function by composing two functions.

The order in the composition matters

It is ESSENTIAL to know how to decompose them .

Stretches of graphs and shifts

http://www.regentsprep.org/Regents/math/algtrig/ATP9/funclesson1.htm

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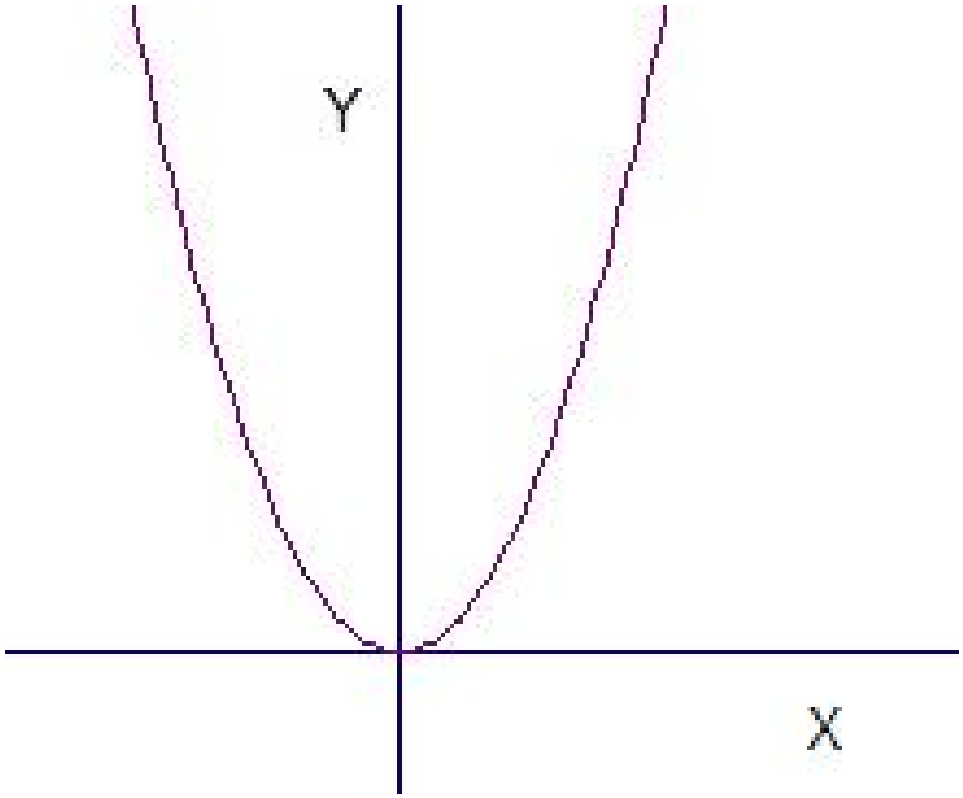
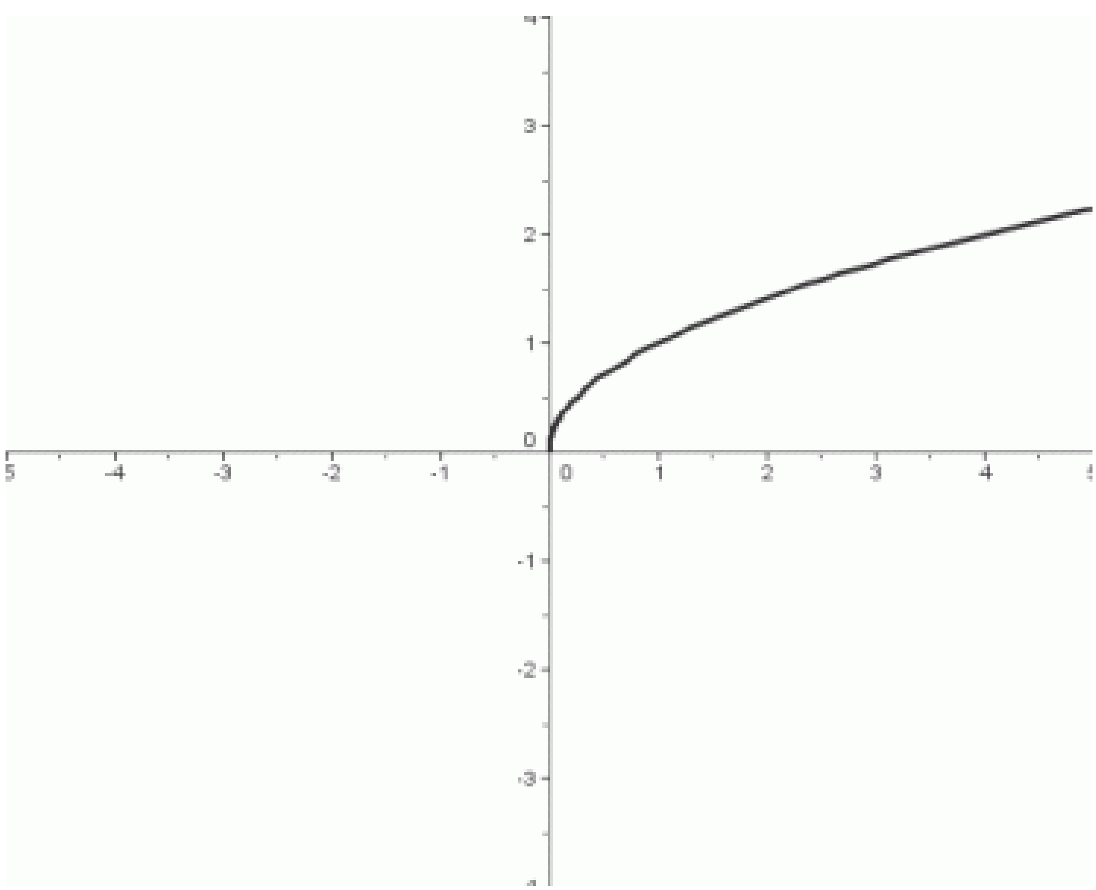
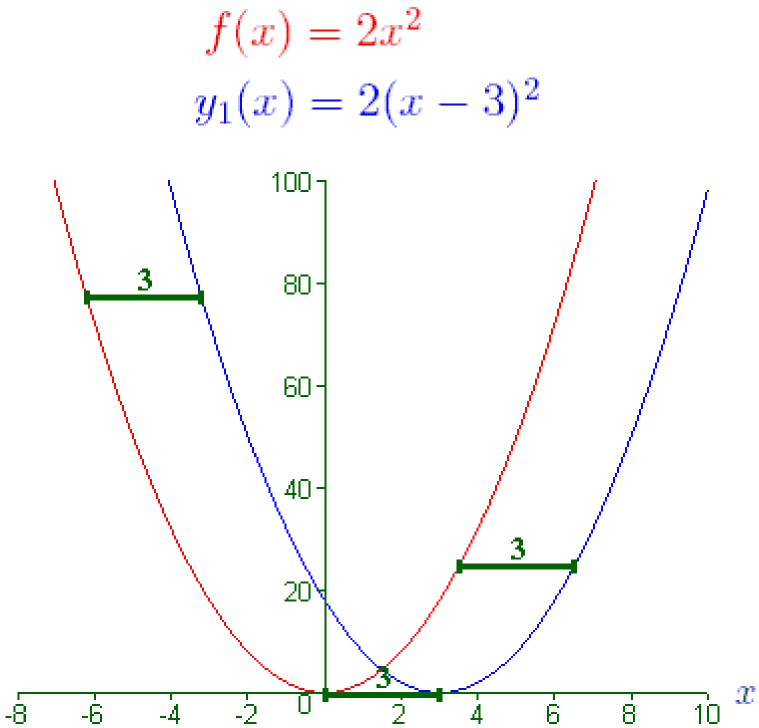
Section 1.9: Proportionality, Power Functions and Polynomials

Power Function

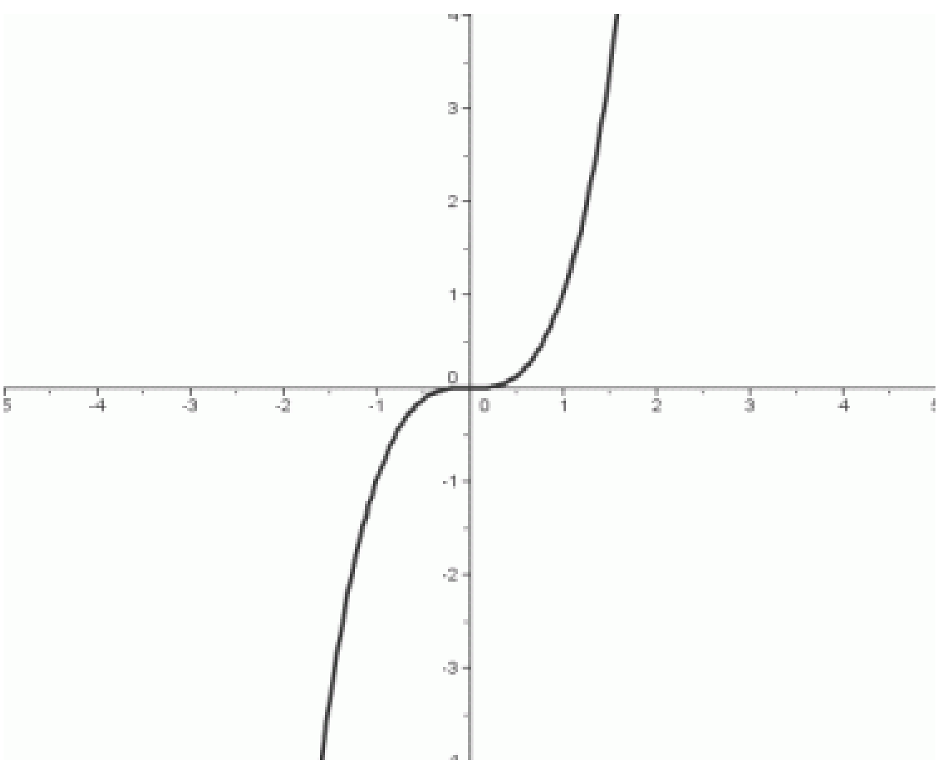
$$f(x) = k \cdot x^p$$


Y
X

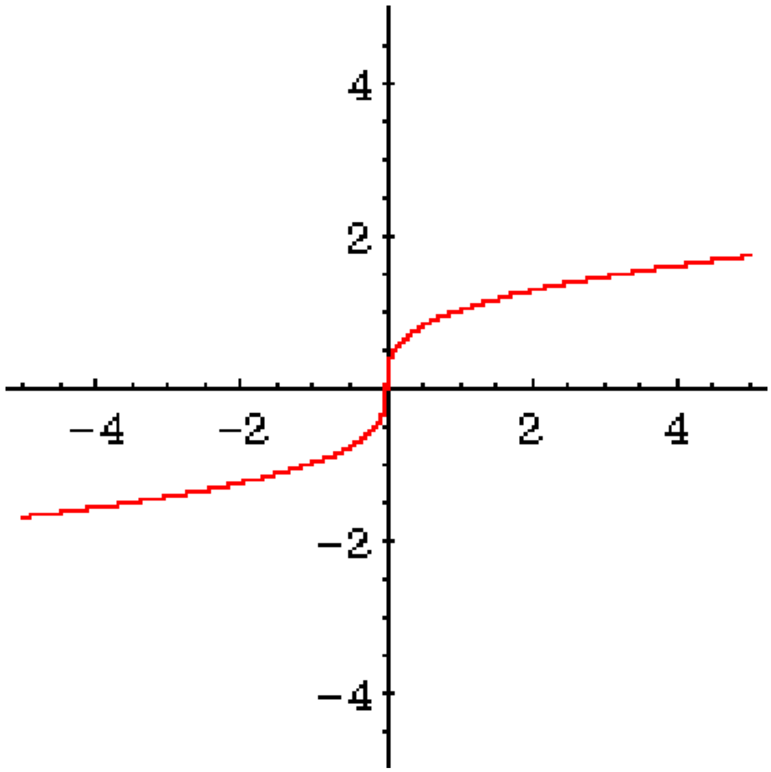

3
2
1
0
-4
-3
-2
-1
0
1
2
3
4
-1
-2
-3

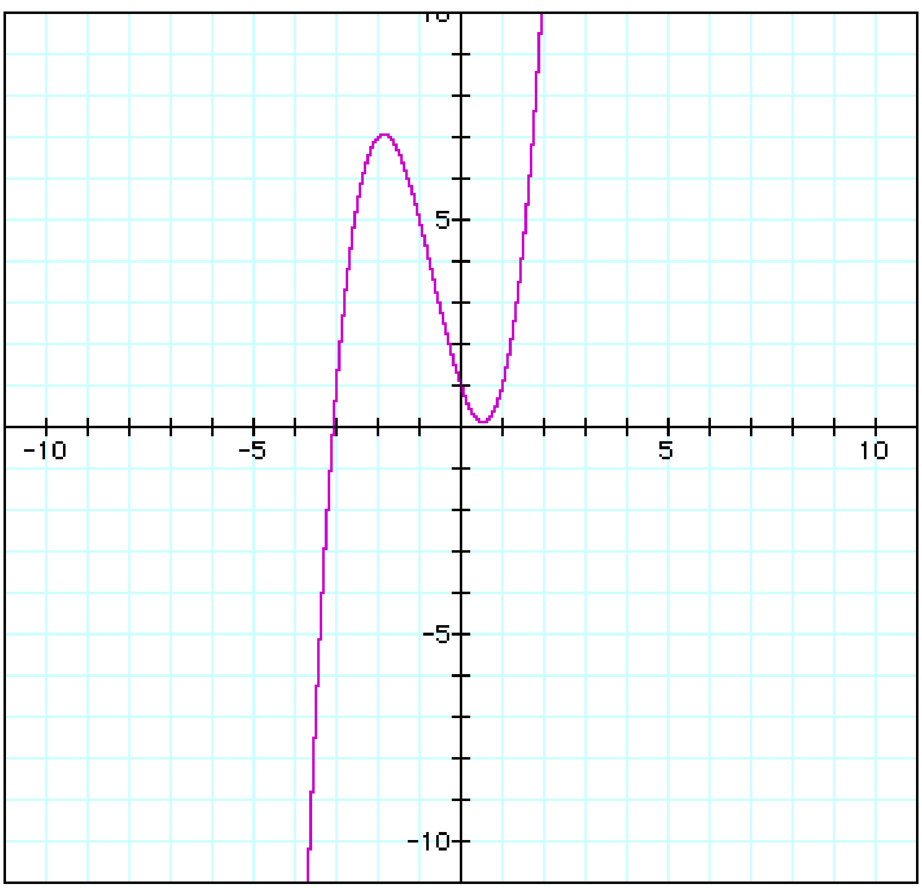


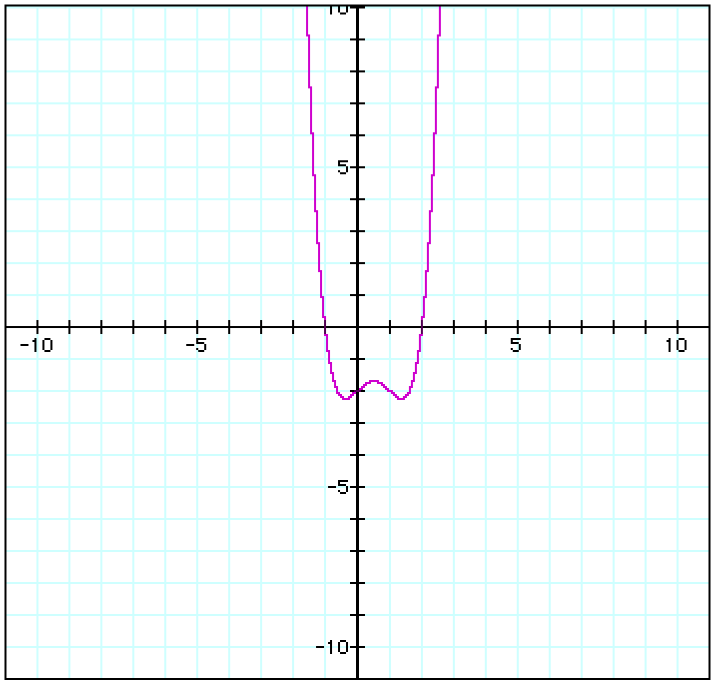
$f(x) = 2x^2$
$y_1(x) = 2(x-3)^2$
100
80
60
40
20
0
3
3
3
-8
-6
-4
-2
2
4
6
8
10
x

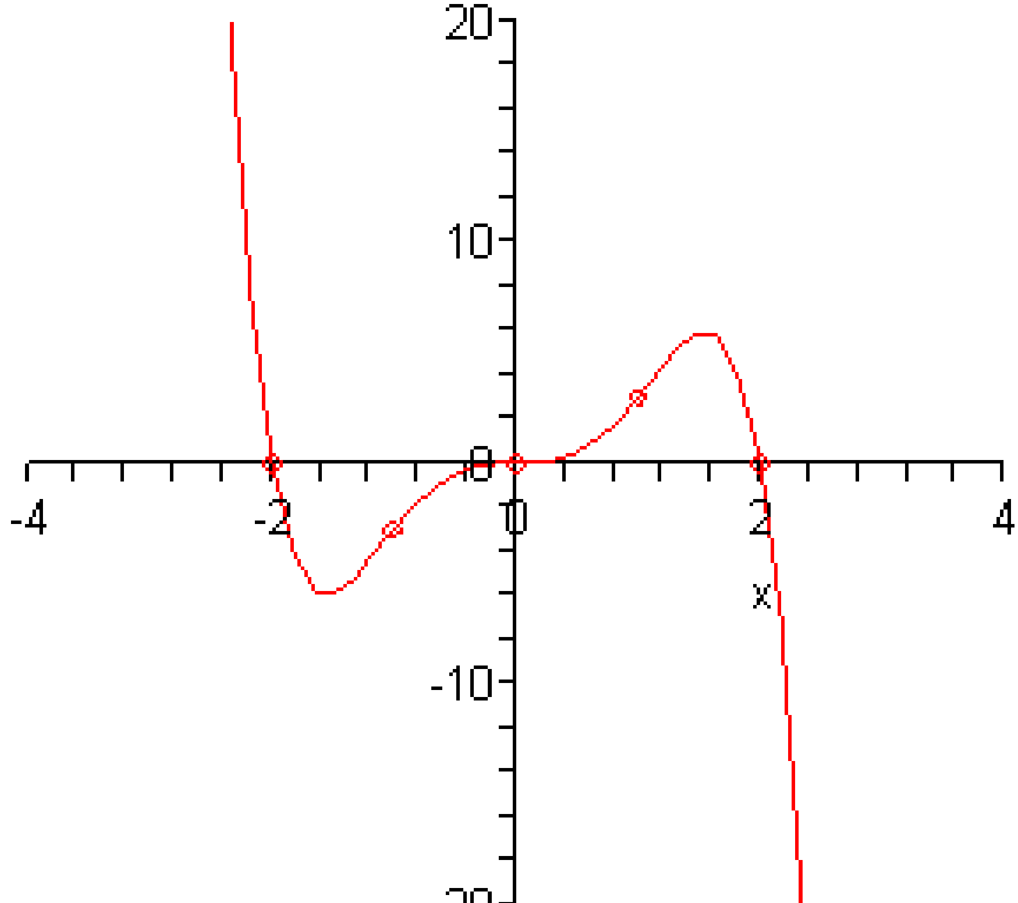


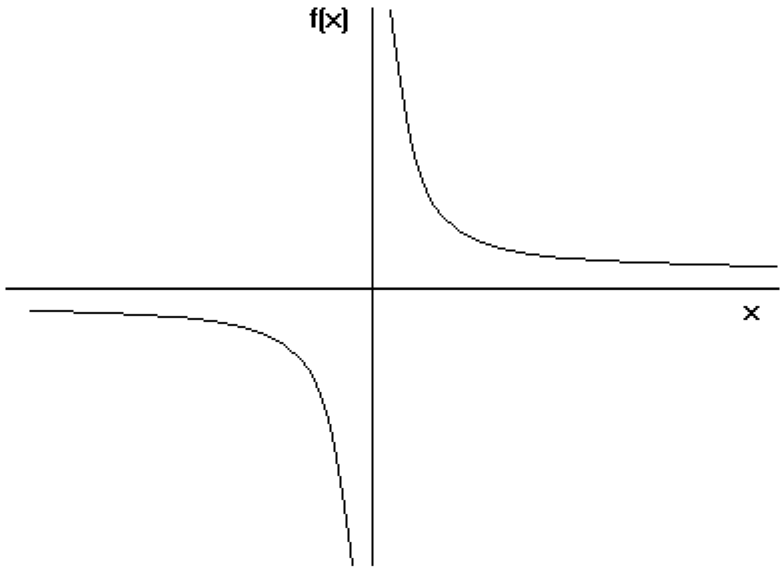
3
2
1
0
-1
-2
-3
-4
-3
-2
-1
0
1
2
3
4

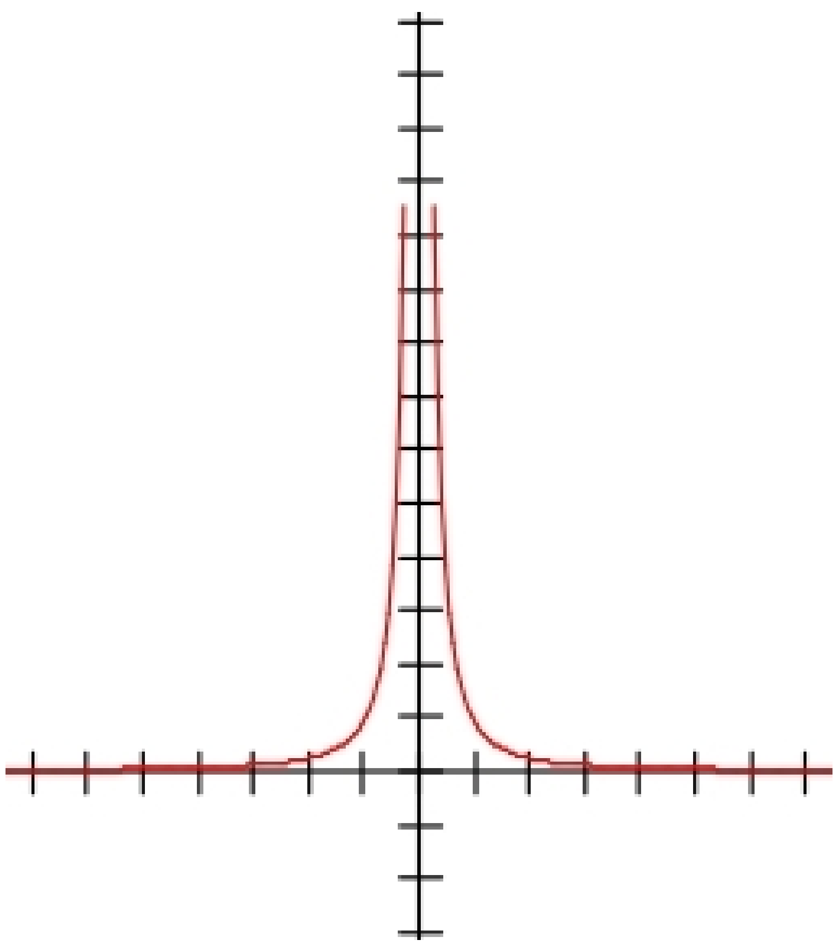

4
2
-2
-4
-4
-2
2
4


10
5
-5
-10
-10
-5
5
10


-10
-5
5
10
-10
-5
5
10


20
10
-10
-20
-4
-2
0
2
4
x





http://prep.math.lsa.umich.edu/cgi-bin/pmc/crtopic?sxn=14&top=1&stpc=1&crssxn=prep