Chapter 1 Section 8

QUADRATIC MODELS

When to use a quadratic model:

*Values decrease and then increase 

*Values increase and then decrease 

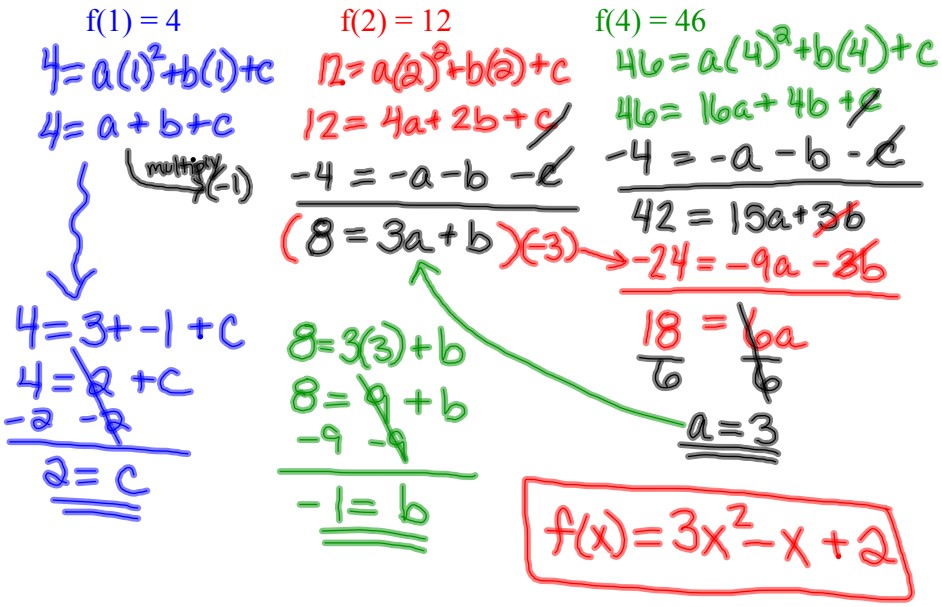
*Values depend on surface area and volume

$SA = 2\pi \cdot r^2 + 2\pi \cdot r \cdot h$ $V = h \cdot \pi \cdot r^2$

EXAMPLE #1

Use the given values to find an equation of the form
$f(x) = ax^2 + bx + c$.

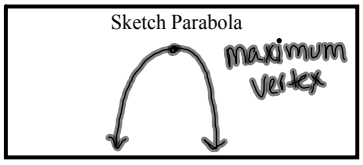
f(1) = 4 f(2) = 12 f(4) = 46



EXAMPLE #2

In an electric circuit, the available power P in watts b a
when a current of I amperes is flowing is given by $P = 110I - 11I^2$.

If you were to plot coordinates (I, P)



a. If the current is increased from 2 amperes to 3 amperes, by how much will the power increase?

$P(2) = 110(2) - 11(2)^2$
$= 220 - 44$
$= 176$

$P(3) = 110(3) - 11(3)^2$
$= 231$
$231 - 176 =$ 55 watts

b. Find the maximum power that can be produced by the circuit.

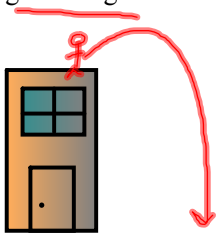
vertex $\left(\frac{-b}{2a}, y\right)$
$\frac{-b}{2a} = \frac{-110}{2(11)} =$ 5 amps

$P(5) = 110(5) - 11(5)^2$
$= 550 - 275 =$ 275 watts

EXAMPLE #3

An object thrown into the air with an initial velocity (v_0) meters per second from a height (h_0) meters above ground is modeled by the function $h(t) = -4.9t^2 + v_0t + h_0$ (model does not account for air resistance). The height of the object will be h(t) after t seconds.

A ball is tossed with an upward velocity of 16 m/s from a building 20m high.



a. Find its height above the ground t seconds later.

$h(t) = -4.9t^2 + 16t + 20$

b. When will the ball reach its highest elevation?

c. When will the ball hit the ground?

Homework

p45 #1, 7, 10, 11