2.1 Day 2 Notes KEY

Saturday, September 12, 2015 9:54 AM

Precalculus
2.1 Notes: Linear Functions & Applications

Name: Key
Period:

LINEAR FUNCTIONS

1st Degree Polynomials:

Two Forms:

SLOPE-INTERCEPT	POINT-SLOPE
$y = mx + b$	$y - y_1 = m(x - x_1)$
$m = \text{slope} \ (\Delta y / \Delta x)$	$m = \text{slope}$
$b = y\text{-int}$	$(x_1, y_1) = \text{point on line}$

(#1-2) Write the equation for the linear function when:

1. $f(2) = -3,\ f(-4) = -5$

$(2,-3) \quad (-4,-5)$

$m = \frac{-5+3}{-4-2} = \frac{-2}{-6} = \frac{1}{3}$

$\boxed{y+5 = \frac{1}{3}(x+4)}$

$\boxed{y+3 = \frac{1}{3}(x-2)}$

OR

$\boxed{y = \frac{1}{3}x - \frac{11}{3}}$

2. $f(4) = 10,\ f(1) = -3$

$(4,10) \quad (1,-3)$

$m = \frac{-3-10}{1-4} = \frac{-13}{-3}$

$\boxed{y-10 = \frac{13}{3}(x-4)}$

$\boxed{y+3 = \frac{13}{3}(x-1)}$

$\boxed{y = \frac{13}{3}x - \frac{22}{3}}$

APPLICATIONS OF LINEAR AND QUADRATIC FUNCTIONS

1. Camelot Apartments bought a $50,000 building and for tax purposes are depreciating it $2,000 per year over a 25-year period using straight-line depreciation.

a. What is the rate of change of the value of the building?

-2000 (↓$2000 every one year)

b. Write an equation for the value v(t) of the building as a linear function of the time, t, since the building was placed in service.

$v(t) = -2000t + 50000$

c. What is the value of the building after 2 years? After 16 years?

$v(2) = -2000(2) + 50000$

$v(2) = \boxed{\$46,000}$

$v(16) = -2000(16) + 50000$

$v(16) = \boxed{\$18,000}$

d. When will the value of the building be $39,000?

$39000 = -2000t + 50000$

$t = \boxed{5.5 \text{ years}}$

VERTICAL FREE-FALL MOTION

The **height** s and **vertical velocity** v of an object in free fall are given by:

$$h(t) = -\frac{1}{2}gt^2 + v_0 t + h_0$$

Where t is time (in seconds), $g \approx 32 \text{ ft/sec}^2 \approx 9.8 \text{ m/sec}^2$ is the acceleration due to gravity, v_0 is the initial vertical velocity of the object, and h_0 is its initial height.

A few examples ...

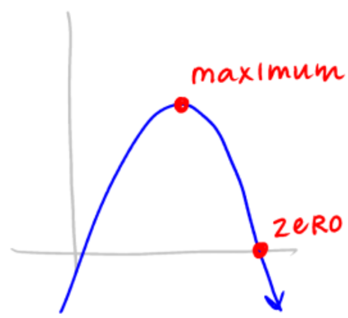
2. At the Bakersville Fourth of July celebration, fireworks are shot by remote control into the air from a pit that is 10 feet below the Earth's surface.

a. Find an equation that models the height of an aerial bomb t seconds after it is shot upwards with an initial velocity of 80 ft/sec.

$$h(t) = -16t^2 + 80t - 10$$

b. What is the maximum height above ground level that the aerial bomb will reach? How many seconds will it take to reach that height?

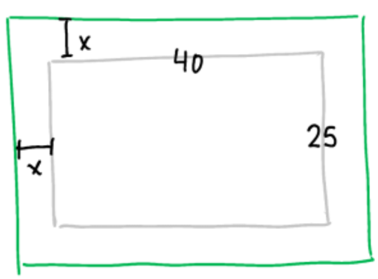
90 ft after 2.5 sec



c. When will the firework hit the ground?

after ~ 4.87sec

3. Patrick designed a rectangular patio that is 25 ft by 40 ft. This patio is surrounded by a terraced strip of uniform width planted with small trees and shrubs. If the area of the terrace is 1504 square feet, find the width of the terraced strip.



$$l \cdot w = A$$

$$(40+2x)(25+2x) = 1504$$

$$1000 + 80x + 50x + 4x^2 = 1504$$

$$4x^2 + 130x - 504 = 0$$

$$(2x + 72)(2x - 7) = 0$$

$$x = \cancel{-36} \qquad x = \boxed{3.5 \text{ ft wide}}$$