

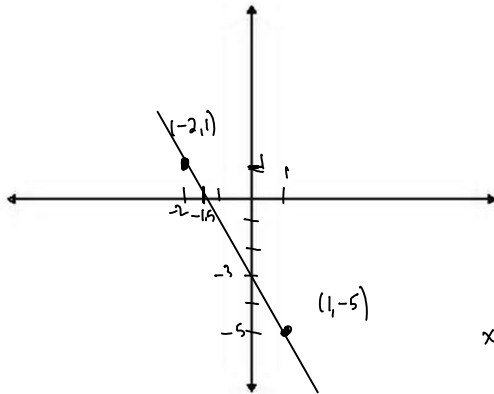
Quiz 2 Solutions

Math 175

Quiz 2

Name: _____

1. Sketch the graph and find the equation of the line that contains the points $(-2, 1)$ and $(1, -5)$ and find both intercepts.



$$m = \frac{y_1 - y_0}{x_1 - x_0} = \frac{-5 - 1}{1 - (-2)} = \frac{-6}{3} = -2$$

$$y - y_0 = m(x - x_0)$$

$$y - 1 = -2(x - (-2))$$

$$y - 1 = -2(x + 2)$$

$$y = -2x - 4 + 1$$

$$y = -2x - 3$$

y int. is -3

$$x \text{ int. : } 0 = -2x - 3$$

$$+3 = -2x$$

$$x = -1.5$$

2. A biologist introduced a new species of frog to a small pond that she was studying. She put in 120 frogs 4 years ago and they are not doing well. If there are 70 today, and the population is following a linear trend, find the linear equation that relates the population P to the time t in years. When does the relation predict that population will die out completely?

let $t=0$ be today, so $f(4) = 120$, $f(0) = 70$

slope is $m = \frac{\text{rise}}{\text{run}} = \frac{-50}{4} = -12.5 \text{ frogs/year}$

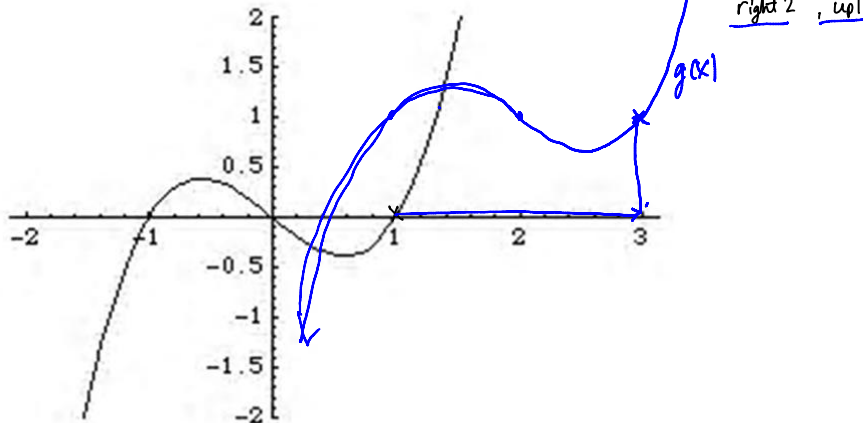
y int. is $f(0) = 70$, $\rightarrow f(t) = -12.5t + 70$

Frogs will die out when $f(t) = 0$

$$-12.5t + 70 = 0$$

$$t = \frac{70}{12.5} =$$

3. The graph of a function $f(x)$ is shown. Sketch the graph of $g(x) = f(x - 2) + 1$.



4. Consider the quadratic function $f(x) = -x^2 - 2x + 8$.

(a) Find the vertex and the x -intercepts.

$$h = \frac{-b}{2a} = \frac{-(-2)}{2(-1)} = \frac{2}{-2} = -1$$

vertex @ $(-1, 9)$

$$k = f(-1) = -(-1)^2 - 2(-1) + 8 = -1 + 2 + 8 = 9$$

$$f(x) = -(x^2 + 2x - 8) = -(x+4)(x-2)$$

so x intercepts are at $x = -4$ and $x = 2$

(b) Where does $f(x)$ intersect the line $g(x) = 2x + 3$?

$$-x^2 - 2x + 8 = 2x + 3$$

$$0 = x^2 + 4x - 5$$

$$0 = (x+5)(x-1)$$

intersections occur at points

$$\text{w/ } x = 1, x = -5$$

$$x = -5, y = g(-5) = 2(-5) + 3 = -7$$

$$(-5, -7)$$

$$x = 1,$$

$$y = g(1) = 2(1) + 3 = 5$$

$$(1, 5)$$

5. A 300-room hotel in Las Vegas is filled to capacity every night at \$80 a room. For each \$1 increase in rent, 3 fewer rooms are rented. If each rented room costs \$10 to service per day, how much should the management charge for each room to maximize gross profit? What is the maximum gross profit? FOR FULL CREDIT SET UP AN APPROPRIATE QUADRATIC FUNCTION AND FIND ITS VERTEX.

$x = \#$ of \$1 rent increases,

price per room = $80 + x$

number of rooms rented = $300 - 3x$ } revenue = $(80 + x)(300 - 3x)$

cost to service rented rooms = $10(300 - 3x)$

profit = revenue - cost

$$= (80 + x)(300 - 3x) - 10(300 - 3x)$$

$$P(x) = (300 - 3x)[(80 + x) - 10]$$

$$P(x) = (300 - 3x)(70 + x)$$

→ Profit has x -ints at $x = 100, x = -70$
to maximize profit should set x at the vertex

$$x = \frac{100 + (-70)}{2} = 15 \rightarrow \text{make 15 price increases to } \$95 \text{ per room}$$

The max. gross profit is $P(15) = (300 - 3(15))(70 + 15) = \$21,675$ per night.