

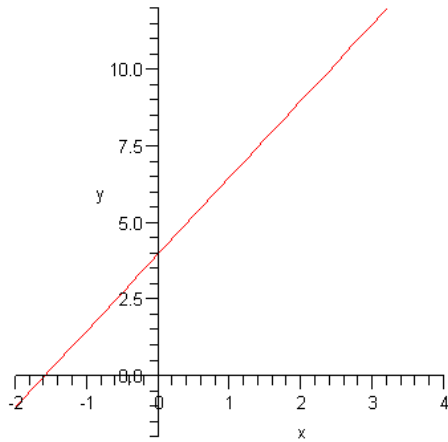
## Math 116

### Test Review Notes from Class

#### Linear Models

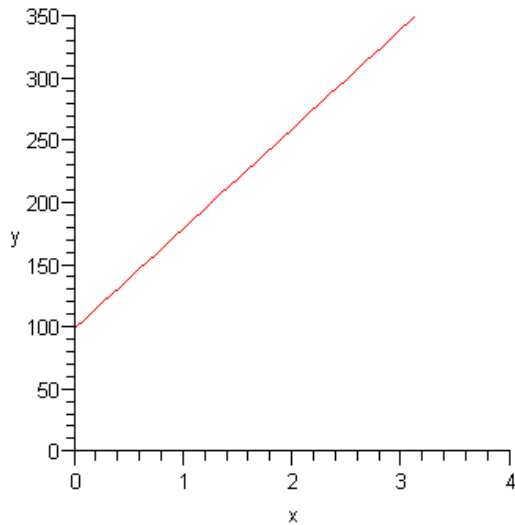
1) Graph  $y = \frac{5}{2}x + 4$

x	y
-2	$y = \frac{5}{2}(-2) + 4 = -5 + 4 = -1$
-1	$y = \frac{5}{2}(-1) + 4 = \frac{-5}{2} + 4 = \frac{3}{2}$
0	$y = \frac{5}{2}(0) + 4 = 0 + 4 = 4$
1	$y = \frac{5}{2}(1) + 4 = \frac{5}{2} + 4 = \frac{13}{2} = 6\frac{1}{2}$
2	$y = \frac{5}{2}(2) + 4 = 5 + 4 = 9$



- 2) A salesperson is paid \$100 plus \$80 per sale each week. The model  $S = 80x + 100$  is used to calculate the salesperson's weekly salary where  $x$  is the number of sales per week.

a) Graph  $S = 80x + 100$



- b) Use the model to calculate the salesperson's weekly salary if he/she makes 8 sales.

$$x = 8$$

$$S = 80x + 100 = 80(8) + 100 = 640 + 100 = \$740$$

- c) What is the slope of the model?

$$m = 80$$

### Quadratic Models

- 3) Find the vertex and x-intercepts, and then make a sketch of the parabola.

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

$$\text{vertex: } x = -\frac{b}{2a} = \frac{-(-4)}{2(1)} = 2$$

$$y = 2^2 - 4(2) = 4 - 8 = -4$$

$$(2, -4)$$

x-intercepts

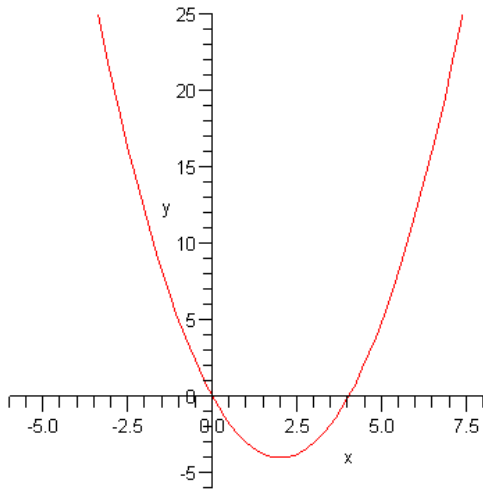
$$x^2 - 4x = 0$$

$$x(x - 4) = 0$$

$$x = 0 \text{ or } x - 4 = 0$$

$$x = 0 \text{ or } x = 4$$

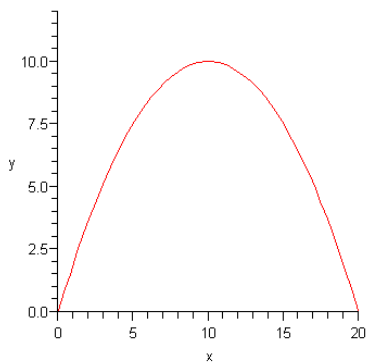
$$(0,0) \text{ or } (4,0)$$



- 4) The path of a ball thrown by a boy is given in yards by the equation  $y = -.1x^2 + 2x$  where  $x$  is the horizontal distance the ball travels and  $y$  is the height of the ball. Find the maximum height of the ball in yards.

$$x = \frac{-2}{2(-.1)} = \frac{-2}{-.2} = 10$$

$$y = -.1(10)^2 + 2(10) = -.1(100) + 20 = -10 + 20 = 10 \text{ yards}$$



- 5) The population of the United States is 300 million. What would be the population of the U. S. be in 20 years, if its population would growth at a steady rate of 1.6 % for 20 years?

$$P_0 = 300$$

$$r = 1.6\% = .016$$

$$t = 20$$

$$P = 300(1 + .016)^{20} = 300(1.016)^{20} = 300(1.3736) = 412 \text{ million}$$

- 6) In 2003, the United States had greenhouse emissions of about 1800 million metric tons. What would be the greenhouse emissions in 20 years, if the emissions would grow at steady 0.8% (last year's growth rate)?

$$P = 1800(1 + .008)^{20} = 1800(1.008)^{20} = 2111$$

- 7) The exponential model for finding the accumulated balance on a principal of \$5,000 at an interest rate of 1.2% is given by the formula  $A = 5000e^{.012t}$ . Use this model to calculate the accumulated balance for 15 years.

$$A = 5000e^{.012(15)} = 5000e^{.18} = 5000(1.1972) = \$5986.00$$

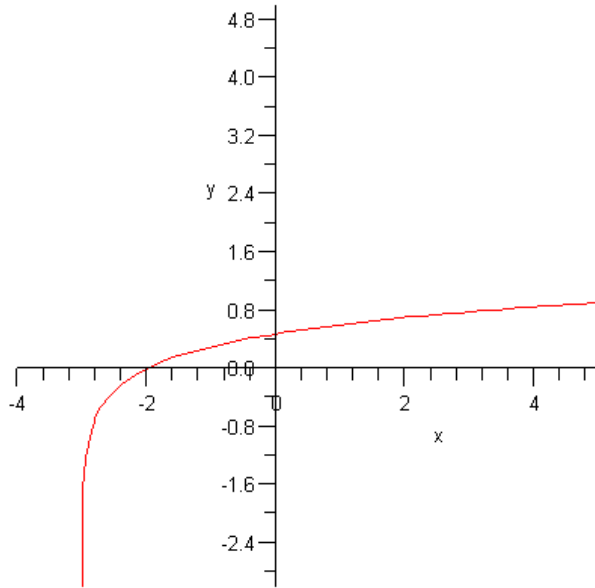
- 8) Write  $5^3 = 125$  as a logarithmic expression

$$5^3 = 125 \Rightarrow \log_5 125 = 3$$

- 9) Write  $\log_6 216 = 3$  as an exponential expression

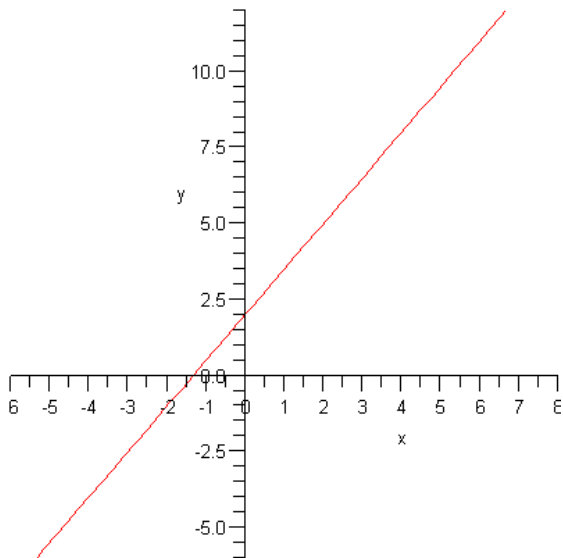
$$\log_6 216 = 3 \Rightarrow 6^3 = 216$$

- 10) Graph  $y = \log(x + 3)$



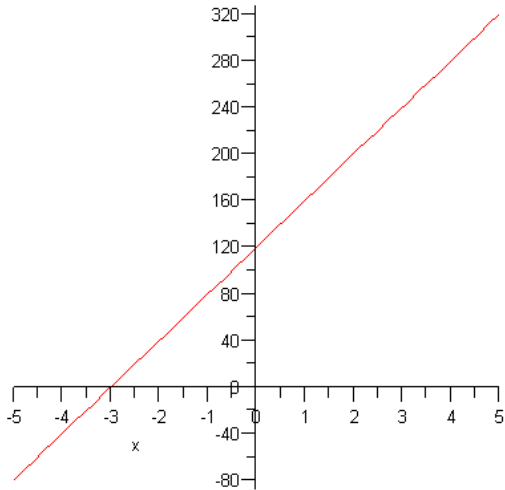
### Test Review Solutions

1) Graph  $y = \frac{3}{2}x + 2$



- 2) A salesperson is paid \$140 plus \$40 per sale each week. The model  $S = 40x + 120$  is used to calculate the salesperson's weekly salary where  $x$  is the number of sales per week.

a. Graph  $S = 40x + 120$



b. Use the model to calculate the salespersons weekly salary if he/she makes 8 sales.  $S = 40(8) + 120 = 320 + 120 = \$440$

c. What is the slope of the model?  $m = \$40/\text{sale}$

3) Find the vertex and x-intercepts, and then make a sketch of the parabola.

$$y = x^2 - 6x$$

$$\text{vertex: } x = -\frac{b}{2a} = -\frac{-6}{2(1)} = 3$$

$$y = 3^2 - 4(3) = 9 - 12 = -3$$

$$(3, -3)$$

x-intercepts

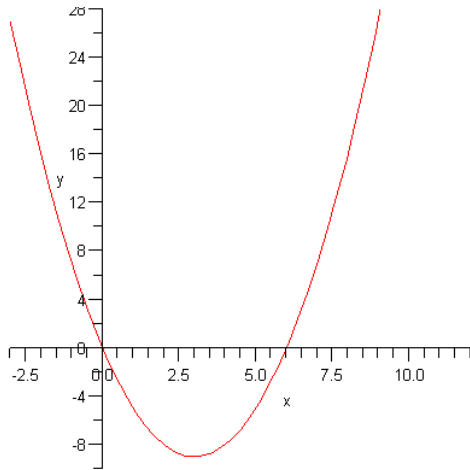
$$x^2 - 6x = 0$$

$$x(x - 6) = 0$$

$$x = 0 \text{ or } x - 6 = 0$$

$$x = 0 \text{ or } x = 6$$

$$(0,0) \text{ or } (6,0)$$

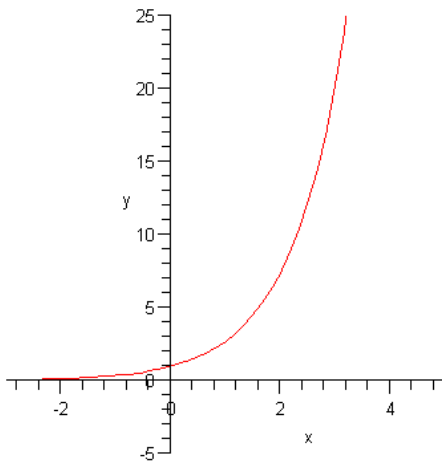


- 4) The path of a ball thrown by a boy is given in yards by the equation  $y = -.08x^2 + 2.3x$  where  $x$  is the horizontal distance the ball travels and  $y$  is the height of the ball. Find the maximum height of the ball in yards.

$$x = -\frac{2.3}{2(-.08)} = \frac{2.3}{.16} = 14.375$$

$$y = -.08(14.375)^2 + 2.3(14.375) = -.1(206.6) + 33.1 = -20.66 + 33.1 = 12.4 \text{ yards}$$

- 5) Graph  $y = e^x$



6) The population of the Norfolk, Virginia is 234,000. What would be the population of Norfolk be in 10 years, if its population would growth at a steady rate of 1.6 % for 10 years?

$$P_0 = 234,000$$

$$r = 1.6\% = .016$$

$$t = 10$$

$$P = 234,000(1 + .016)^{10} = 234,000(1.016)^{10} = 234,000(1.172) = 274,248$$

6) In 2003, the United States had greenhouse emissions of about 1900 million metric tons. What would be the greenhouse emissions in 10 years, if the emissions would grow at steady 0.8% (last year's growth rate)?

$$P = 1900(1 + .008)^{10} = 1900(1.008)^{10} = 2057$$

7) The cost to produce barrels of French wine is given by the equation  $C = 350x + 1500$ .

a) Use the equation to figure out the cost to make 150 barrels.

$$C = 350x + 1500 = 350(150) + 1500 = 52500 + 1500 = \$54000$$

b) Use the equation to figure out how many barrels of wine can be bought with \$2000

$$2000 = 350x + 1500$$

$$2000 - 1500 = 350x + 1500 - 1500$$

$$500 = 350x$$

$$x = \frac{500}{350}$$

$$x = 1.4$$

1 barrel

9) The exponential model for finding the accumulated balance on a principal of \$5,000 at an interest rate of 1.2% is given by the formula  $A = 5000e^{.012t}$ . Use this model to calculate the accumulated balance for 10 years.

$$A = 5000e^{.012(10)} = 5000e^{.12} = 5000(1.127) = \$5637.48$$

10) Write  $\log_5 3125 = 5$  as an exponential expression.

$$5^5 = 3125$$

11) Write  $4^3 = 64$  as a logarithmic expression.

$$\log_4 64 = 3$$