Math 150
Chapter R Exam
Fall 2015

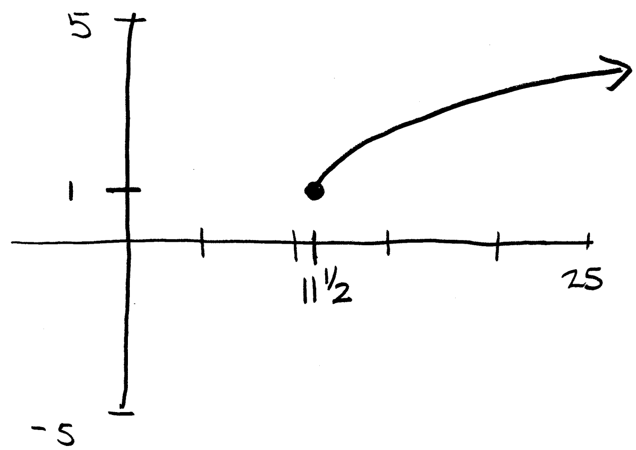
Name: KEY

Solve each problem using the methods demonstrated in class; be sure to answer word problems in a phrase or sentence.

1) Use a graphing calculator to graph in an appropriate viewing window: $y = 1 + \sqrt{2x - 23}$

State the domain in interval notation: $[23/2, \infty)$

State the range in interval notation: $[1, \infty)$



$2x - 23 \geq 0$

$2x \geq 23$

$x \geq 23/2$

$x \geq 11\frac{1}{2}$

2) Use the function $f(x) = x^2 + 8x$ to find the following:

a) $f(3) = (3)^2 + 8(3) = 9 + 24 = \boxed{33}$

b) $f(-2) = (-2)^2 + 8(-2) = 4 - 16 = \boxed{-12}$

c) $f\left(\frac{1}{3}\right) = \left(\frac{1}{3}\right)^2 + 8\left(\frac{1}{3}\right) = \frac{1}{9} + \frac{8}{3} = \frac{1}{9} + \frac{24}{9} = \boxed{\frac{25}{9}}$

d) $f(a+7) = (a+7)^2 + 8(a+7) \Rightarrow a^2 + 14a + 49 + 8a + 56$

$= \boxed{a^2 + 22a + 105}$

e) $\frac{f(x+h) - f(x)}{h} = \frac{(x+h)^2 + 8(x+h) - (x^2 + 8x)}{h} = \frac{\cancel{x^2} + 2xh + h^2 + \cancel{8x} + 8h - \cancel{x^2} - \cancel{8x}}{h}$

$\frac{2xh + h^2 + 8h}{h} = \boxed{2x + h + 8}$

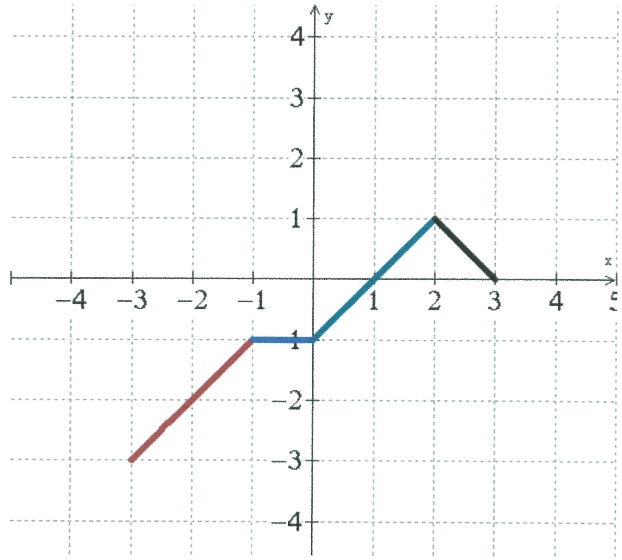
3) Given the graph of the function.

a) State the domain: $[-3, 3]$

b) State the range: $[-3, 1]$

c) Find the x- value(s) for which f(x) = 0

$x = 1, \; x = 3$



4) A shoe company will make a new type of shoe. The fixed cost for the production will be $24,000. The variable cost will be $32 per pair of shoes. The shoes will sell for $108 for each pair.

a) Find the cost function C(x) $\boxed{C(x) = 32x + 24{,}000}$

b) Find the revenue function R(x) $\boxed{R(x) = 108x}$

c) Find the profit function P(x) $P(x) = 108x - (32x + 24{,}000)$

$\boxed{P(x) = 76x - 24{,}000}$

d) What profit or loss will the company realize if the sale of the shoes is 400 pairs?

$P(400) = 76(400) - 24{,}000$ $\boxed{\text{Profit of } \$6400}$

$= 6400$

e) How many pairs of shoes will have to be sold for the company to break even on this new line of shoes?

$$32x + 24{,}000 = 108x$$

$$24{,}000 = 76x$$

$$\frac{24{,}000}{76} = x$$

$$315.7 \approx x$$

$\boxed{\text{316 shoes must be sold to break even}}$

5) Solve each equation. Be sure to give exact answers.

a) $x^2+8x=3$

$x^2+8x-3=0$ quad formula

$X=\dfrac{-8\pm\sqrt{(8)^2-4(1)(-3)}}{2(1)}$

$X=\dfrac{-8\pm\sqrt{76}}{2}$ $\begin{smallmatrix}4\\19\end{smallmatrix}$

$X=\dfrac{-8\pm2\sqrt{19}}{2}=-4\pm\sqrt{19}$

$\boxed{X=-4+\sqrt{19},\ -4-\sqrt{19}}$

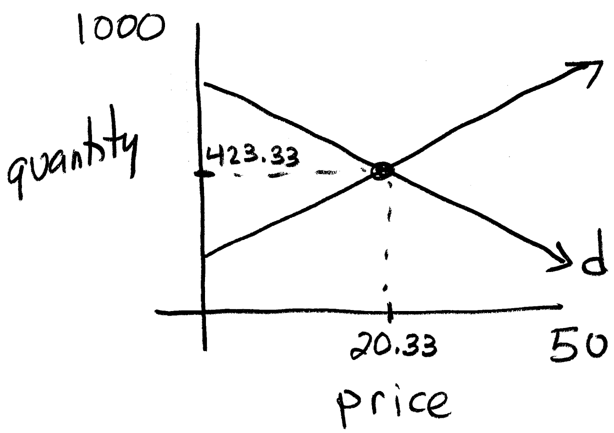
b) $\left(1-\dfrac{6}{x}-\dfrac{16}{x^2}=0\right)x^2$

$x^2-6x-16=0$

$(x-8)(x+2)=0$

$\boxed{x=8,\ x=-2}$

6) Given the supply and demand functions, determine the equilibrium point. Graph both functions in an appropriate window, label the axes, and indicate the equilibrium point.
Demand: $q=830-20x$ and Supply: $q=220+10x$ where x is the price in dollars.



equilibrium point
(20.33, 423.33)

price \$20.33
quantity ≈ 423

7) **Exponents:**

Rewrite the following using radical notation:

a) $x^{\frac{1}{7}}$

$\sqrt[7]{x}$

b) $m^{3/5}$

$\sqrt[5]{m^3}$

c) $y^{-\frac{2}{3}}$

$\frac{1}{\sqrt[3]{y^2}}$

Rewrite the following with rational exponents:

d) $\sqrt[3]{x^6}$ $= x^{6/3}$

$= \boxed{x^2}$

e) $\frac{1}{\sqrt{x^3}}$ $= \frac{1}{x^{3/2}} = \boxed{x^{-3/2}}$

8) **Lines:**

a) Find the equation of the line that contains the points $(-3, 5)$ *and* $(-1, -3)$

$m = \frac{-3-5}{-1-{}^{-}3} = \frac{-8}{2} = -4$

$y - y_1 = m(x - x_1)$

$y - 5 = -4(x + 3)$

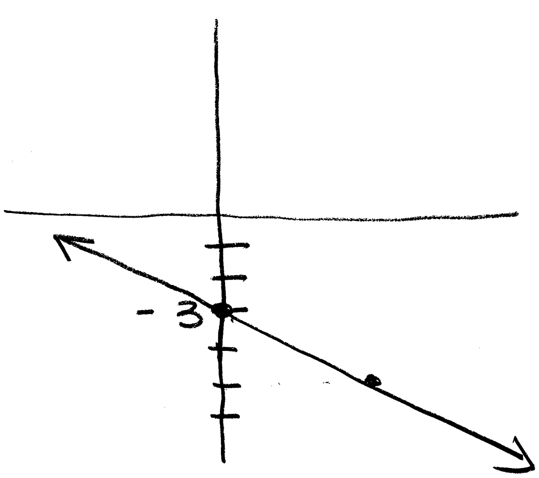
$y - 5 = -4x - 12$

$\boxed{y = -4x - 7}$

b) Graph the line by determining the slope and y-intercept: $2x + 3y + 9 = 0$

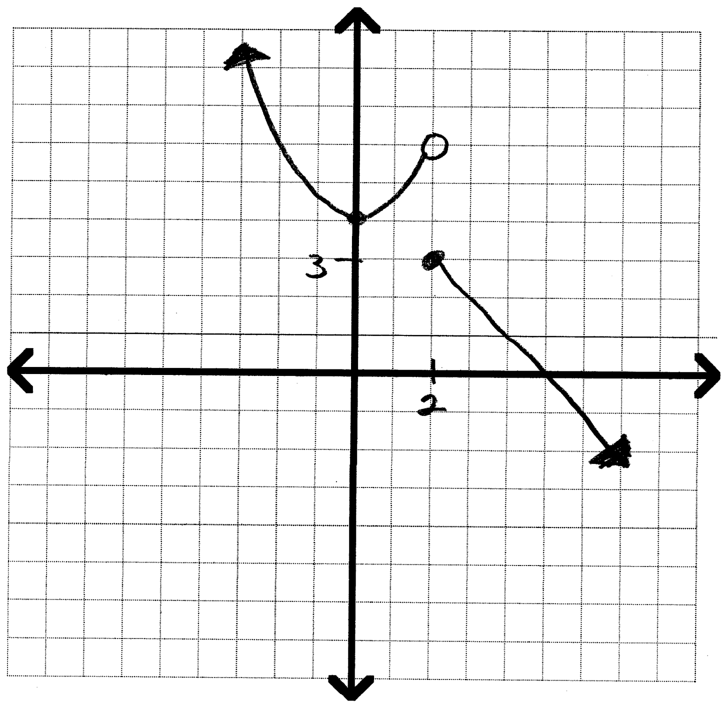
$3y = -2x - 9$

$y = \frac{-2}{3}x - 3$

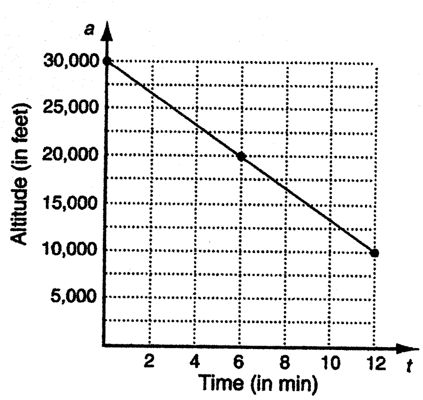


9) Graph the piece-wise function:

$$f(x)=\begin{cases}\frac{1}{2}x^2+4 & \text{for } x<2\\ 5-x & \text{for } x\geq 2\end{cases}$$



10) Find the average rate of change from t= 6 to t = 12 and interpret:



(6, 20,000)

(12, 10,000)

$= \frac{20,000 - 10,000}{6 - 12}$

$= \frac{10,000}{-6}$

$\boxed{= {}^{-}1666\tfrac{2}{3} \text{ ft/min}}$

from 6MIN to 12MIN the altitude is decreasing on average 1666⅔ ft/min