Name:

HW 7: §2.4-3.1

Complete the following problems to the best of your ability. **SHOW ALL OF YOUR WORK.** Unshown work will not be graded. You may use a calculator.

1. Let $f(x) = -1.5x + 3$

   (a) Find the equation of a line that is parallel to f that goes through the point $(0, 2)$.

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

   (b) Find the equation of a line that is perpendicular to f that goes through the point $(-1, 3)$.

   $y = \frac{2}{3}x + b$

   $3 = \frac{2}{3}(-1) + b$

   $\frac{11}{3} = b$

   $y = \frac{2}{3}x + \frac{11}{3}$

2. Find a function for y in terms of x if y is directly proportional to x and the function goes through the point $(2, 7)$.

   $y = kx$

   $7 = k2$

   $\frac{7}{2} = k$

   $y = \frac{7}{2}x$

3. Suppose a dragon has been flying towards a town at a rate of 120 miles per hour since midday. By 6PM, he is 500 miles away from the city.

   (a) Find an equation that gives $D(t)$, the distance between the dragon and the city t hours after midday.

$m = -120$

$y = -120x + b$ $\quad D(t) = -120t + 1220$

$500 = -120 \cdot 6 + b$

$1220 = b$

   (b) How far away was the dragon at midday when he started his journey?

1220 mi

   (c) How close is the dragon at 3:30 PM?

$D(3.5) = 800$ mi away

   (d) How long do the townsfolk have until the dragon gets to them?

10.16 hours

until 10:10 PM

4. Find the intersection of the following lines.

   (a) $y = 2x - 4$ and $y = -3x + 6$.

$2x - 4 = -3x + 6$

$5x = 10$

$x = 2$ $\quad (2, 0)$

$\hookrightarrow y = 0$

   (b) $y = \frac{1}{2}x - 6$ and $y = \frac{1}{2}x + 10$.

$\frac{1}{2}x - 6 = \frac{1}{2}x + 10$

$0 = 16$

no intersection

(these lines are parallel)

5. Suppose the supply equation of a product is given by $s = 2q - 15$ and the demand equation is given by $d = -5q + 44$. Find the equilibrium point of the supply and demand.

$2q - 15 = -5q + 44$

$7q = 59$

$q = 59/7 \simeq 8.4$

($8.4, \$31.85$)

6. Suppose a radioactive isotope's mass deteriorates over time, and that the decay is exponential. Suppose the mass of an object made of this isotope is 150g after three years, and then 127.5g after four years.

   (a) What is the yearly percent change in the mass of the object?

$$\frac{127.5-150}{150} = -15\%$$

   (b) Find a function for $M(t)$, the mass of the object as a function of time t in years.

$M(t) = P_0(.85)^t$

$150 = P_0(.85)^3$ so $M(t) = 244(.85)^t$

$244 = P_0$

   (c) What was the mass of the object originally?

$244\,g$

   (d) What is the mass of the object after 10 years?

$48.03\,g$

Optional Problems:
2.6: 21-30
2.7: All, but don't worry about finding intersections graphically.
3.1: All