Final Practice Exam Math 160

1. Simplify the following expressions:
   (a) $\dfrac{10^{12}}{10^3}$.
   (b) $e^7 \times e^3$.
   (c) $e^{x+2} \times e^{x^2-x-2}$.
2. Solve the following equations:
   (a) $4 + (7x - 1) = 12x - 8$.
   (b) $2x^2 - 6x = 0$.
   (c) $\dfrac{3}{x+1} = 2x - 6$.
3. Find the equation of the line that passes through $(1, 3)$ and $(7, 12)$ and answer the following questions:
   (a) What is the y-intercept of the line?
   (b) What is the x-intercept of the line?
   (c) Is it parallel to the line $y = \frac{3}{2}x + 1$?
4. Solve the following inequalities:
   (a) $2x - 3 > 8$.
   (b) $|2x - 1| > 4$.
   (c) $\dfrac{2x-1}{3x+4} < 5$.
5. Let $f(x) = x^2 - 3x$ and $g(x) = 3x - 7$
   (a) Find $f \circ g(0)$.
   (b) Find $f \circ g(1)$.
   (c) Find $f \circ g(a)$.
   (d) Find $g \circ f(2)$.
   (e) Find $g \circ f(b)$.
6. Suppose that the demand and price for a certain brand of shampoo are related by
$$p = 16 - \frac{5}{4}q,$$
   where p is price in dollars and q is demand.

(a) What is the price if the demand is 4 units?

(b) What is the demand for the shampoo at a price of \$16.

Suppose the price and supply of the shampoo are related by

$$p = \frac{3}{4}q,$$

where q represents the supply and p the price.

(c) Find the supply when the price is \$10.

(d) Find the equilibrium quantity.

(e) Find the equilibrium price.

7. Find the equation of the parabola that has a vertex at $(-1, -2)$ and passes through the point $(1, 2)$.

8. Suppose you are the manager of a firm. The accounting department has determined that the cost estimate for a new product is $C(x) = 65x + 7000$. The sales department expects a revenue of $R(x) = 300x - x^2$. You know that you can only product at most 150 units. How many units must the firm sell to break even?

9. Calculate the following logarithms:

   (a) Find $\log_3(1)$.

   (b) Find $\log_2((8))$.

   (c) Find $\log(10^{10})$.

   (d) Find $\ln(10)$.

   (e) Find $\ln(10^{10})$.

10. Solve the following equations:

    (a) $2^x = 128$.

    (b) $100(1.02)^x = 256$.

    (c) $x^7 = 2187$.

11. Suppose Alice deposited \$1000 dollars into an account compounded annually. After five years, Alice finds out she has \$1503 in her account. She forgot what the annual interest rate in her account was. Find the interest rate.

12. Find the following limits (if they don't exist write DNE):

    (a) Find $\lim_{x \to 2} \frac{1}{x+2}$.

    (b) Find $\lim_{x \to 2} \frac{1}{x-2}$.

    (c) Find $\lim_{x \to 2} \frac{x^2-4}{x-2}$.

    (d) Find $\lim_{x \to \infty} \frac{1}{x-2}$.

(e) Find $\lim_{x\to\infty} \dfrac{3x^3 - 7x^2 + 18000}{2x^3 - 2}$.

13. Find the following derivatives:

    (a) Find $x + 2$.

    (b) Find $x^3 + x - 2$.

    (c) Find $\dfrac{x^2 - 4}{x - 2}$.

    (d) Find $\dfrac{1}{x - 2}$.

    (e) Find $\left(x^2 + 5x\right)^{10}$.

14. Let $f(x) = 3x^2 - 7x + 2$.

    (a) Find the minimum of $f(x)$.

    (b) Find $f^{'}(x)$.

    (c) Find $f^{'}(3)$.

    (d) Find the equation of the line tangent to $f(x)$ when $x = 3$.