Math Review

1. The market for bike locks is described by the demand curve $P = 120 - 6Q_d$ and the supply curve $Q_s = 0.25P - 5$. Answer the following questions:

   (a) When the price of bike locks is \$30 how many bike locks will be demanded? How many bike locks will be produced?

   (b) When the quantity demanded of bike locks is 12 what is the price consumers are willing to pay?

   (c) What is the market equilibrium values of price and quantity in the market of bike locks?

2. Solve the following system of equations:

   (a) $m + 9t = 16,\ 4m - 2t = 5$

   (b) $x + y = 13,\ 4x - 3y = 24$

Helpful Derivative Formulae:

Common Functions:

$\frac{d}{dx}c = 0$

$\frac{d}{dx}ax^n = n * ax^{n-1}$

$\frac{d}{dx}e^x = e^x$

$\frac{d}{dx}ln(x) = \frac{1}{x}$

Rules:

$\frac{d}{dx}cf(x) = cf'(x)$

$\frac{d}{dx}[f(x) \pm g(x)] = f'(x) + g'(x)$

$\frac{d}{dx}[f(x)g(x)] = f'(x)g(x) + f(x)g'(x)$

$\frac{d}{dx}[f(g(x))] = f'(g(x))g'(x)$

3. Find the first derivative of $F(x)$ with respect to x:

(a) $F(x) = 2x$

(b) $F(x) = 3x^2$

(c) $F(x) = 0.5x^4 + 5x + 39$

(d) $F(x) = x(x-2)$

(e) $F(x) = x^{1/2}$

(f) $F(x) = x^{2/3} + 4$

(g) $F(x) = \sqrt{x} * x^1$

(h) $F(x) = 3x + 4k$, with k a scalar

4. Find the partial derivatives of the following

   (a) $F(x, y) = 3x + 4y$

   (b) $g(r, w) = rw^3 + r^2w^2$

   (c) $Q(L, K) = L^{1/2}K^{1/2}$

   (d) $U(x, y) = x^{\alpha}y^{\beta}$

   (e) $U(x, y) = x^{1/3}y^{2/3}$

   (f) $Q(L, K) = 3L + 4K$

5. Consider the function $g(x) = -x^2 + 10$.

   (a) Does this function have a minimum or a maximum? How do you know?

   (b) What is the minimum/maximum of this function? (Hint: use $\frac{\partial g}{\partial x} = 0$.)