Midterm Exam #1 - March 4, 2012

- **For full credit you must show all your work.**

- **Begin each problem on a separate sheet of paper.**

- **You are allowed to use a graphing calculator or app. (But note that the exam can be completed without one).**

- **Use the provided sheet of coordinate planes for your graphs.**

- **Write your name at the top of every sheet of paper.**

1. Consider the function $f(x) = |2x - 3|$.

   (a) Solve the equation $|2x - 3| = 5$.
       (Extra credit: Check your answer by plugging your solution(s) back into $f(x)$.)

   (b) Sketch the graph of $f(x)$.

   (c) Label the point(s) on the graph corresponding to the solution(s) you found for the equation in part (a).

2. Consider the function $g(x) = mx + b$ where m and b are constants.

   (a) Describe in a sentence or two what the graph of $g(x)$ looks like. In particular, describe what the quantities m and b represent on the graph.

   (b) Sketch the graph of $g(x)$ for $m = -\frac{1}{2}$ and $b = -1$. Label the $x-$ and $y-$ intercepts.

3. Consider the piecewise-defined function $h(x)$:

   $$h(x) = \begin{cases} x^2 & \text{if } -3 < x \leq 0 \\ 1/x & \text{if } x > 0 \end{cases}$$

   (a) Find each of the following:
       i. $h(-2)$
       ii. $h(0)$
       iii. $h(100)$

   (b) Sketch the graph of $h(x)$.

   (c) What are the domain and range of h? Use interval notation or inequalities to represent these sets of real numbers.

4. Consider the function $f(t) = 3t + 1$.

   (a) Find $f(t + h)$ (i.e., write down the rule for computing $f(t + h)$. Hint: Your answer will be in terms of t and h.)

   (b) Show that the difference quotient for f simplifies as follows:

   $$\frac{f(t + h) - f(t)}{h} = 3$$

   (c) (Extra credit) For $g(x) = mx + b$ (as in Exercise (2) above), show that:

   $$\frac{g(x + h) - g(x)}{h} = m$$