Math 0031 **Midterm Exam 1**

Spring 2017 **Name:** _____

No calculators, no notes, no books are permitted.

SHOW ALL WORK (no work = no credit). Write neatly. Simplify your answers when possible.

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1. Consider the relation $\{(2,3),(0,4),(3,-2),(2,0),(5,1)\}$.

   (a) (4 points) Determine whether the relation is a function.

   (b) (4 points) Identify the domain and the range.

2. (5 points) Find a slope-intercept equation of the line that passes through the point $(-2,1)$ and is perpendicular to the line $y = -\frac{1}{3}x + 2$.

3. (8 points) Solve the compound inequality $x - 11 \leq 1 - 2x$ or $5 < 9 - 2x$.

4. (8 points) The width of the soccer field recommended for players under the age 12 is 35 yd less than the length. The perimeter of the field is 330 yd. Find the dimensions of the field.

5. (10 points) For the function $f(x) = x^2 - x$ find the difference quotient $\dfrac{f(x+h) - f(x)}{h}$.

6. Simplify. Write answers in the form $a + bi$ where a and b are real numbers.

(a) (3 points) $(-3 + i) - (4 - 2i)$.

(b) (4 points) $(2 + 3i)(1 - 2i)$.

(c) (4 points) i^{55}.

(d) (6 points) $\dfrac{2 + 3i}{1 + 2i}$.

7. The purpose of this problem is to draw the graph of the function $f(x) = \frac{1}{3}x^2 - 2x + 4$ by transforming the graph of the function $g(x) = x^2$.

(a) (6 points) By completing the square write $f(x)$ in the form $a(x-h)^2 + k$.

(b) (8 points) The graph of $g(x) = x^2$ is given. Do step by step transformations of $g(x)$ to draw the graph of $f(x)$. On the second figure draw the graph of the function ax^2, on the third draw $a(x-h)^2$, and finally on the last plot draw the function $f(x) = a(x-h)^2 + k$.

See the next page.

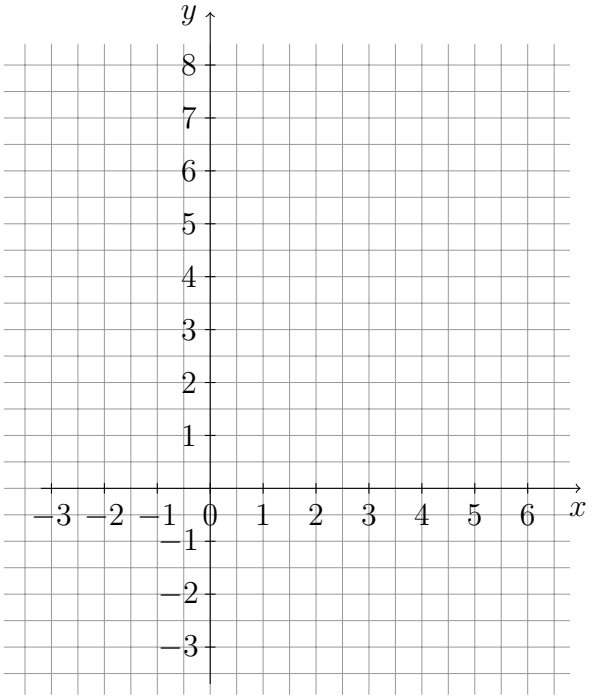

Figure 1: Graph of the function $g(x) = x^2$.

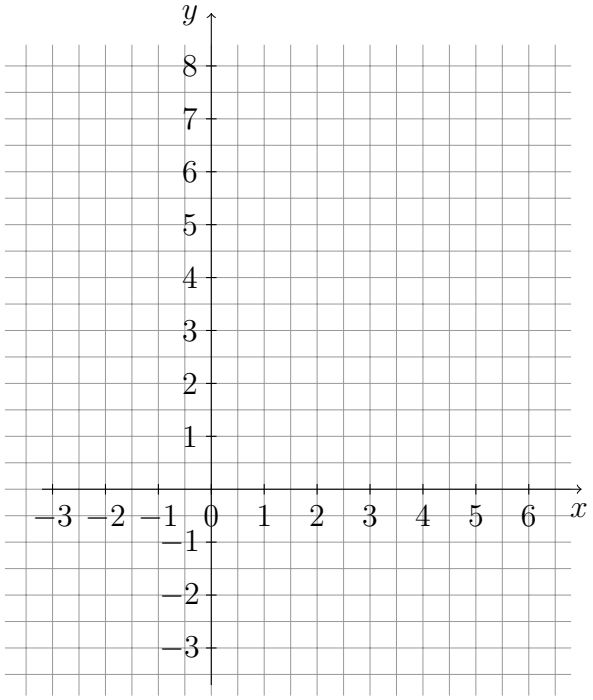

Figure 2: Graph of the function ax^2.

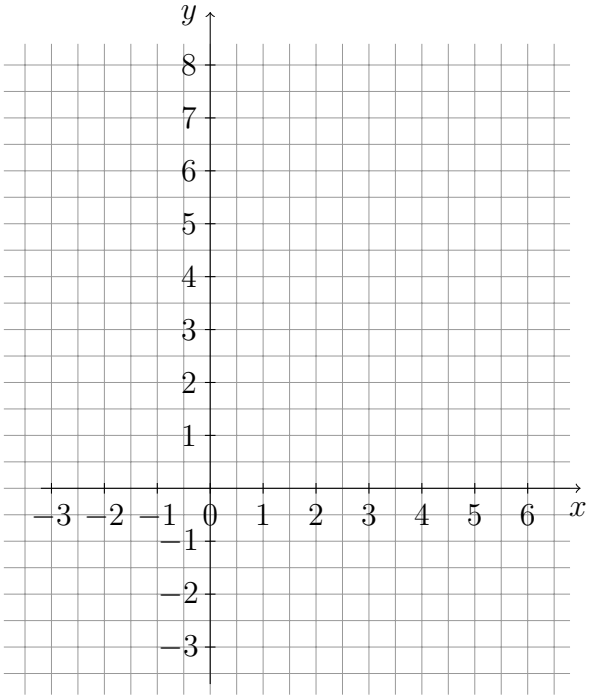

Figure 3: Graph of the function $a(x - h)^2$.

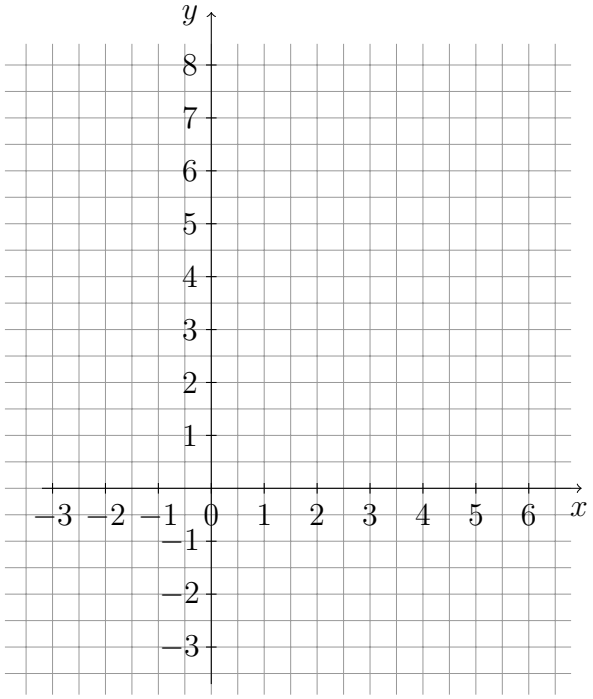

Figure 4: Graph of the function $f(x)$.

8. (10 points) Solve the equation $\sqrt{x+3} - 1 = x$.

9. (10 points) Solve the equation $|x+3| - 2 = 6$.

10. (a) (8 points) Solve the inequality $|2x-3| < 5$ and write interval notation for solution set.

(b) (2 points) Graph the solution set.