Math 127
Exam 2 Practice Problems

1. True or False:
   (a) Every quadratic equation has two distinct real solutions.
   (b) Every absolute value equation has two distinct real solutions.
   (c) $\sqrt{i^4} = -1$
   (d) Every inequality has infinitely many solutions.
   (e) $x = 0$ is a solution to the equation $x(x-2) = 4$
2. Use completing the square to solve the quadratic equation $3x^2 - 12x + 5 = 0$.
3. Solve the following quadratic equations:
   (a) $4x^2 - 5x + 10 = 2x^2 - 8x + 12$
   (b) $3x^2 + 10 = 5x$
4. Perform the indicated operations and express your answer in the form $a + bi$:
   (a) $(3 - 2i) - (12 + 6i)$
   (b) $(3 - 2i)(5 + 3i)$
   (c) $\dfrac{3 - 2i}{3i}$
   (d) $\dfrac{3 - 2i}{2 + 3i}$
   (e) i^{3147}
5. Solve the following equations:
   (a) $7x + 2 = -12$
   (b) $4(x-1) + 3(2-x) = 10$
   (c) $\dfrac{3}{10}x - \dfrac{3}{5} = \dfrac{3}{2}$
   (d) $-20x = 5x^2$
   (e) $(x+6)(x-2) = -7$
   (f) $\dfrac{3}{x+6} - \dfrac{1}{x-2} = \dfrac{-6}{x^2+4x-12}$
   (g) $|2 - 3x| - 3 = 5$
   (h) $x^4 - x^3 - 9x^2 + 9x = 0$
   (i) $8x - x^{\frac{5}{3}} = 0$
   (j) $2 - \sqrt[3]{2x + x^2} = 0$
   (k) $x + 5 = \sqrt{2x + 13}$
   (l) $\sqrt{x+8} = 2 + \sqrt{x}$
   (m) $(y+3)^{\frac{2}{3}} - 2(y+3)^{\frac{1}{3}} - 3 = 0$
6. Solve the following inequalities. Express your answer in interval notation.
   (a) $15 \leq -5x$
   (b) $.3x - .2(3x + 1) < 1$
   (c) $-7 < 3x - 4 \leq 5$
   (d) $2x - 5 \leq 5x - 2 \leq 2x + 7$
   (e) $|5x - 1| > 4$
   (f) $|2x - 3| + 6 \leq 11$
7. Use algebra to solve each of the following. You must clearly define your variables and state your conclusion in a sentence.
   (a) One number is 4 times another. The sum of their reciprocals is $\frac{1}{4}$. Find the numbers.

(b) A boat travels 24 miles upstream in the same time it takes to travel 30 miles downstream. The current is 2 mph. Find the speed of the boat in still water.

(c) Tony has a rectangular garden that measures 4 feet by 6 feet. He wants to double its area by increasing the garden's length and width by the same amount. Find the length and width of his new garden.

(d) The Hamburgler steals a hamburger from a restaurant and flees in his getaway car driving due north on a straight road going 60 miles per hour. The police arrive, and after doing an initial investigation, they chase the Hamburgler in their squad car going 80 miles per hour. If the police begin their pursuit half an hour after the Hamburgler left and neither vehicle changes speeds, how far along the road do the police catch up with him?

8. Solve for r in the equation $r^2 - 4(qs)^2 = 0$

9. Solve for R in the following equation: $F = \dfrac{\pi P R^4}{8vL}$

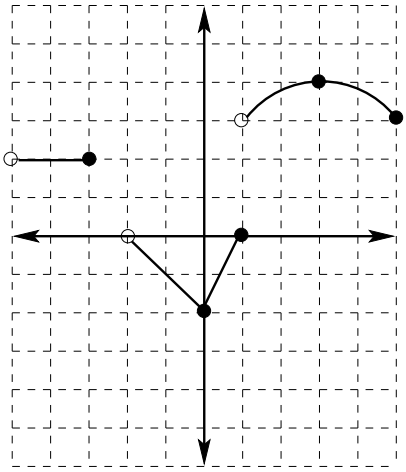
10. Determine whether or not the following equations are symmetric with respect to the x-axis, y-axis, or the origin.

(a) $y = x^4 - x^2$
(b) $y = x^3 - 2x$
(c) $x^2 - y^2 = 1$
(d) $y = 3x - 2$

11. Sketch the graphs of the following functions. Be sure to find and label all x and y intercepts.

(a) $f(x) = -\frac{3}{4}x + 2$
(b) $g(x) = x^3 - 4x$
(c) $y = \sqrt{x - 4}$
(d) $y = 4 - x^2$
(e) $f(x) = \begin{cases} x - 2 & \text{if } x \leq 4 \\ 2x - 6 & \text{if } x > 4 \end{cases}$
(f) $f(x) = \begin{cases} 3x - 2 & \text{if } x < 1 \\ 4 & \text{if } x = 1 \\ x^2 - 1 & \text{if } x > 1 \end{cases}$

12. For the given graph of $f(x)$, find the following:



(a) $f(0)$
(b) $f(3)$
(c) x, when $f(x) = 2$
(d) The domain of f
(e) The range of f
(f) The intervals where f is decreasing.

13. Let $f(x) = x^2 - 2x$. Find and simplify the following:

(a) $f(2)$, and $f(\frac{2}{3})$
(b) $f(a + 3)$
(c) $f(2a - 1)$
(d) $\dfrac{f(a + h) - f(a)}{h}$

14. Determine whether or not the following are functions:

(a) $\{(3, 4), (5, 7), (2, -1), (6, 8), (8, 6)\}$
(b) $\{(1, 2), (3, 7), (4, -12), (5, 8), (7, 2)\}$
(c) $\{(1, 2), (2, 3), (3, 4), (4, 5), (3, 5)\}$