Math 102 Final Exam name_____
March 12, 2012

Honor Statement

"I affirm that my work upholds the highest standards of honesty and integrity, and that I have neither given nor received any unauthorized assistance on this exam."

Signature _____

Instructions:

- Show all your work, and draw a box around your final answer.
- Basic or scientific calculators are allowed; graphing calculators and cell phones are not.
- Turn off and put away cell phones, headphones, and other eletronics.
- Your test should have 17 problems on 8 pages (not including this cover page)—double-check that it does!

Quadratic Formula: The solutions of the equation $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

1. Factor as much as possible:

(a) $2qr^2 - 8q$

(b) $y(z+5) + a(z+5)$

(c) $z^2 + 9$

(d) $3m^3n - 3mn$

2. If $2y - kx = 3$ and $6x - 2y = 2$ are parallel, what is k?

3. Multiply and collect like terms: $(x^2 - xy - 4y^2)(x^2 + 4y^2)$.

4. Solve the following equations. If the solution is imaginary, say so. Otherwise, check at least one of your solutions in the original equations.

(a) $2x^2 - 1 = 4x$

(b) $x^2 + 3x = 9$

(c) $x^2 - 32 = -4x$

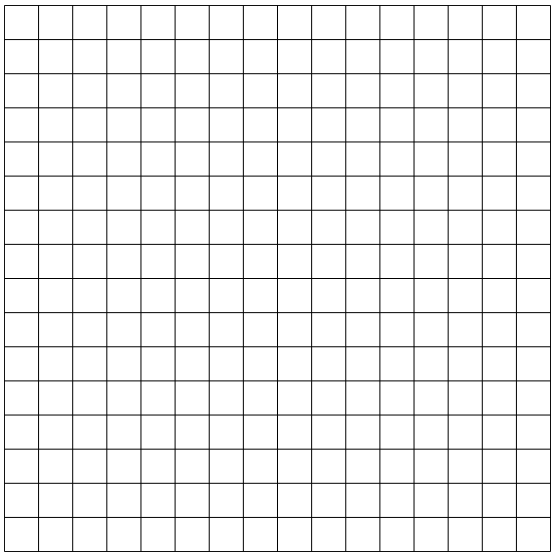
Solve by completing the square:

(d) $x^2 - 3x + 1 = 0$

(e) $x^2 - 6x + 10 = 0$

5. Evaluate $(-8)^{-\frac{4}{3}}$.

6. Graph $y = x^2 + 3x - 4$, showing the roots and vertex.



7. Find the roots of:

(a) $y = x^3 - 4x^2 + 3x$

(b) $y = 3x^2 + x + 4$

8. Solve the following equations. Check all solutions in the original equation.

If there are no solutions, or the answer is imaginary, say so.

(a) $\sqrt[3]{4+(m-1)^2}+1=3$

(b) $\sqrt{4z^2-3}=3$

(c) $8-\left|y^3-5\right|=4$

9. Simplify the following radical expressions:

(a) $\dfrac{\sqrt{48y^2z^5}}{\sqrt{2yz}}$

(b) $\sqrt[3]{16x^{14}y}\cdot\sqrt[3]{5y^4}$

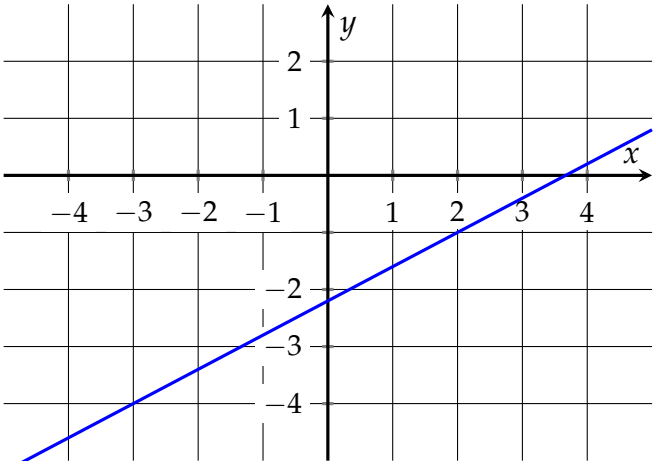
10. Find the x-intercept(s) and y-intercept of $y = 2x^2 - x - 1$.

11. True or false: a quadratic equation can have three different solutions.

12. Find the equations of:

(a) The line perpendicular to $4x + 5y = 3$ and passing through $(-2, 3)$

(b) The following line:



13. A cat jumps off a 4-foot table, with a starting velocity of 0.

(a) Fill in the equation for its height h after t seconds have passed:

$$h(t) = -16t^2 + \square\, t + \square.$$

(b) How high is it after $\frac{1}{4}$ second?

(c) When does it reach the ground?

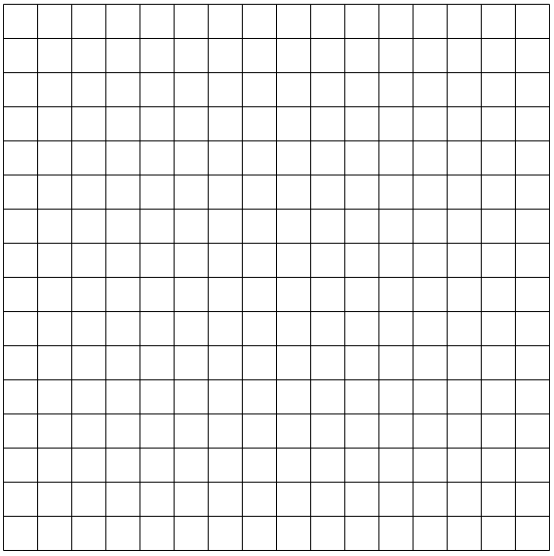
14. Fill in the blanks:

(a) $\sqrt{3} \cdot \square = 9$

(b) $\sqrt[\square]{r^6} = r^2$

15. Solve the following system of equations, using *both* the graphical and algebraic methods. Check that your solutions from the two methods agree.

$$\begin{cases} 2x + y = 2 \\ -3x + 2y = -10 \end{cases}$$

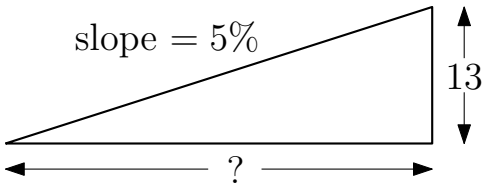


16. Solve each of the following systems of equations algebraically. Check your solutions (if any) in both of the original equations.

(a) $\begin{cases} -2x + 6y = 0 \\ -x + 9y = 1 \end{cases}$

(b) $\begin{cases} 2x - 2y = -4 \\ -3x + 3y = 6 \end{cases}$

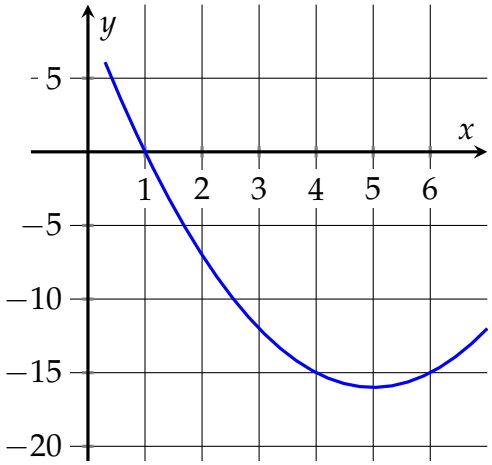
17. The road outside the IC has a slope of 5%. One end of the block is 13 feet higher than the other. How long is the block?



Extra credit.

(a) Fill in the equation for the parabola pictured below:

$y = x^2 + \square\, x + \square$



(b) You are buying snacks for the Math 102 post-final party. Bagels cost 55¢ each and bananas cost 35¢ each. You need to purchase 18 items total, but don't want to spend more than $8.50.

How much of each item should you buy if you want to spend exactly $8.50?