Instructions: This is a practice test. It is by no means comprehensive, as the test may include situations that practice test does not address. With that said, your WeBWorK and especially the final exam review should give you a good idea of what to expect on your tests. You should write all answers in **simplest rational or radical form**. All imaginary/complex solutions should be written in $a + bi$ form. That means **NO DECIMAL SOLUTIONS.** Your test will be on Friday 3/24/2023.

1. A. [5] Solve the following quadratic equation via quadratic formula.
    1. $4x^2 - x + 3 = 0$
    2. $-4x^2 + 12x + 11 = 0$

    B. [5] Solve the following quadratic equation by completing the square and using the square root property.

    1. $3x^2 - 12x + 13 = 0$
    2. $x^2 + 3x - 11 = 0$

    C. [10] Given the following quadratic equation, calculate the vertex, the x and y-intercepts (solutions of the form $(x, 0)$ and $(0, y)$), then graph.
    1. $y = -x^2 + 8x + 9$
    2. $y = x^2 - 4x - 6$

2. A. [5] Simplify the complex fraction.

    A. $\dfrac{\frac{2}{x} - \frac{3}{x^2}}{\frac{5}{x^2} + \frac{4}{x}}$

    B. $\dfrac{12 - \frac{7}{2y}}{\frac{7}{8y} - 3}$

    C. $\dfrac{\frac{3}{x} + \frac{4}{x+2}}{\frac{9}{x+2} - \frac{2}{x}}$

    B. [5] Divide the complex numbers. Write in $a + bi$ form. $\dfrac{5 + 4i}{3 - 2i}$

3. [10] Write the equation of the circle in standard form. Identify the center and the radius of the circle. Graph the circle and label 4 points on the circle.
    A. $x^2 + 4x + y^2 - 8y - 5 = 0$
    B. $x^2 - 10x + y^2 + 12y + 15 = 0$

4. [10] Solve the following system by elimination.

    $2x - 3y - 6z = -22$
    $2x + 4y - 5z = 32$
    $-4x - 5y + 5z = -30$

    $x + y - z = -2$
    $2x + 2y + 3z = 11$
    $3x - 4y - 3z = 36$

5. Solve the following system.   [10 each]

    A. By Substitution
    $x + 3y = 2$
    $x^2 - 8y^2 = 4$

    B. By Elimination
    $2x^2 + 5y^2 = 88$
    $5x^2 - 3y^2 = -28$

6. Given the two points $(-6, 13)$ and $(8, 11)$.
   - A. [5] Calculate the distance between the two points.
   - B. [10] Calculate the perpendicular bisector between the two points. Write in slope-intercept form.

7. Solve the following equation. [10]
   - A. $\sqrt{2x - 6} + 3 = x$
   - B. $\sqrt{a^2 + 16a + 64} = a + 2$
   - C. $\sqrt{2p^2 - 15p + 23} = p - 3$

8. [10] Assuming all variables are positive (Don't worry about what that means.)
$$\frac{3}{2}ab\sqrt{24a^3} + \frac{2}{3}\sqrt{54a^5b^2} - a^2b\sqrt{96a}$$

9. A. [5] Simplify i^{71}

   B. [5] Assuming all variables are positive, rewrite $(a^{-7}b^8)^{\frac{3}{2}}$ in simplified radical form and without negative exponents.

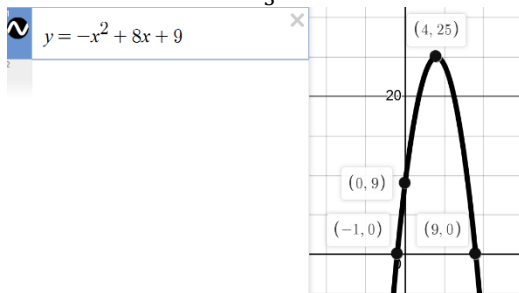10. An object is launched at 19.6 meters per second (m/s) from a 58.8-meter-tall platform. The equation for the object's height h at time t seconds after launch is
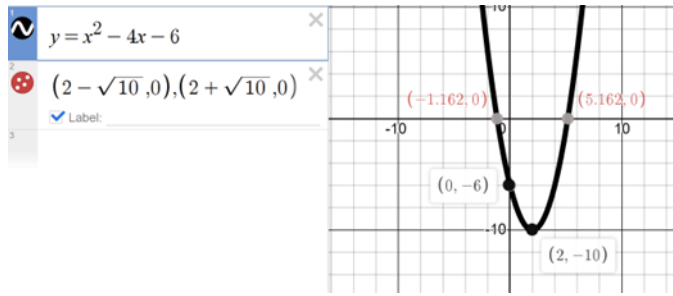$h = -4.9t^2 + 19.6t + 58.8$, where h is in meters.
   - A. What is the height above the ground when the object is launched?
   - B. How long before the object hits the ground after launch?
   - C. How many seconds pass when the object reach its maximum height?
   - D. What is the maximum height of the object?

Answer Key

1. A.   1. $x = \frac{1}{8} \pm \frac{\sqrt{47}}{8}i$ 2. $x = \frac{-3 \pm 2\sqrt{5}}{2}$

   B.   1. $x = -2 \pm \frac{\sqrt{3}}{3}i$ 2. $x = -\frac{3}{2} \pm \frac{\sqrt{53}}{2}$
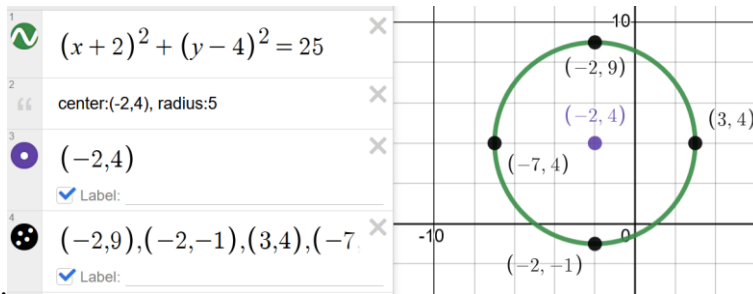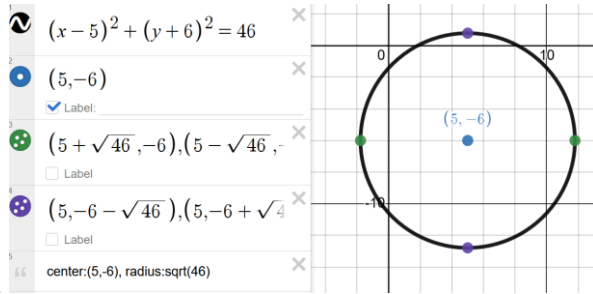

$y = -x^2 + 8x + 9$, with points $(4, 25)$, $(0, 9)$, $(-1, 0)$, $(9, 0)$, and 20 marked on the axis.

   C. 1.

$y = x^2 - 4x - 6$

$(2 - \sqrt{10}, 0), (2 + \sqrt{10}, 0)$

2.

2. A. 1. $\dfrac{2x-3}{4x+5}$ 2. -4 3. $\dfrac{7x+6}{7x-4}$

B. $\dfrac{7}{13} + \dfrac{22}{13} i$

$(x+2)^2 + (y-4)^2 = 25$

center:(-2,4), radius:5

$(-2,4)$

$(-2,9), (-2,-1), (3,4), (-7,$

3. A.

$(x-5)^2 + (y+6)^2 = 46$

$(5,-6)$

$(5+\sqrt{46}, -6), (5-\sqrt{46},$

$(5,-6-\sqrt{46}), (5,-6+\sqrt{4}$

center:(5,-6), radius:sqrt(46)

B.

4. A. $(x, y, z) = (-5, 8, -2)$ B. $(x, y, z) = (7, -6, 3)$
5. A. $(x, y) \in \{(2, 0), (-34, 12)\}$ B. $(x, y) \in \{(2, -4), (2, 4), (-2, -4), (-2, 4)\}$
6. A. $10\sqrt{2}$ B. $y = 7x + 5$
7. A. $x \in \{3, 5\}$ B. $a \neq -5$, **no solution** C. $p = 7, p \neq 2$
8. $a^2 b\sqrt{6a}$
9. A. $-i$ B. $\dfrac{b^{12}\sqrt{a}}{a^{10}}$
10. A. 58.8m B. 6 seconds C. 2 seconds D. 78.4m