CHAPTERS 2 AND 3 – USE YOUR NOTES FOR HELP.

Do each problem without a calculator unless designated as a calculator usage problem.

1. Write a rule for \( g(x) \) described by the transformation of the graph of \( f(x) \).
   a. \( f(x) = x^2 \); translation 4 units down, followed by a vertical stretch by a factor of 5, and then translated 3 units left.
   b. \( f(x) = -x^2 + 8 \); a horizontal shrink by a factor of 1/2, followed by a reflections across the \( x \)-axis.

2. Use the function \( f(x) = -2x^2 - 8x - 3 \) in order to answer the questions below.
   a. Without graphing the function, how can you tell if it has a minimum or maximum value?
   b. Does it have a maximum or minimum value?
   c. What is that value?

3. Use the function \( f(x) = 3x^2 - 12x - 15 \) in order to answer the questions below.
   a. Find the axis of symmetry.
   b. Find the vertex.
   c. Rewrite the function in intercept form.
   d. What are the \( x \)-intercepts of the graph of the function?
   e. What is the \( y \)-intercept of the graph of the function?
   f. Does the graph of the function open up or down?
   g. How can you tell if the graph opens up or down?
4. Rewrite the function, \( y = x^2 - 10x + 5 \), in vertex form.

5. A quarterback throws a football towards a receiver. The quadratic function, \( h(t) = -16t^2 + 40t + 6 \), models the height (in feet) of the football \( t \) seconds.
   a. How long does it take for the football to reach its maximum height? What did you use to find your answer?
   b. How long does it take for the football to hit the ground? What did you use to find your answer?

6. The height (in feet) of an object \( t \) seconds after it is thrown can be modeled by the function \( h(t) = -16t^2 + 64t + 8 \).
   a. What is its initial height?
   b. Write the function in vertex form.
   c. Using the ONLY vertex form, state its maximum height.
   d. Using ONLY its vertex form, state how long it took for the object to reach its maximum height.

7. Graph the function below that is in \( f(x) = -x^2 + 2x + 7 \) form without changing its form. Make a table.

\[
f(x) = -x^2 + 2x + 7
\]
8. Graph the function below that is in __________________ form without changing its form.
\[ f(x) = \frac{1}{2}(x + 1)(x - 7) \]

9. Write an equation of the parabola in vertex form given its vertex is (-2,8) and another point on the curve is (1,5).

10. Write an equation of the parabola in intercept form given its x-intercepts are (-4,0) and (2,0) and another point on the curve is (-1,18).

11. Simplify each expression. If your answer is an imaginary number, express it in standard form.
   a. \( (5\sqrt{3}) \cdot (2\sqrt{6}) \)
   b. \( \frac{15}{\sqrt{5}} \)
   c. \( \frac{6}{5 - \sqrt{3}} \)
d. \((−3 + 4i) − (5 − 2i)\)  
e. \((-9 − 3i)(4 − 7i)\)  
f. \(\frac{15}{1−3i}\)

12. State the discriminant of each quadratic equation. Then using ONLY the discriminant describe the number and type of solutions for each.
   a. \(4x^2 + 12x + 9 = 0\)  
b. \(-2x^2 − 5x − 8 = 0\)  
c. \(5x^2 + 7x = 4\)

13. Simplify the expression, \(\frac{3 ± 12\sqrt{5}}{3}\).

14. Solve each equation. Use the best method to do so.
   a. \(x^2 − 6x + 25 = 0\) Best method ___________________________
   b. \(2x^2 + 3x − 9 = 0\) Best method ___________________________
   c. \(6x^2 − x + 1 = 0\) Best method ___________________________
   d. \(\frac{1}{3}(x + 4)^2 − 6 = 9\) Best method ___________________________
15. Find the zeros of each function.
   a. \( f(x) = 4x^2 + 80 \)
   b. \( g(x) = x^2 - 64x \)

16. Find the real number zeros of the function \( 5x^2 - 2x - 8 = 0 \) using your graphing calculator.

17. Solve each of the inequalities both graphically and algebraically.
   a. \( x^2 + 5x + 6 \geq 0 \)
   b. \( x^2 - x < 12 \)
18. Solve the system.

\[ 3x^2 - 5x - y = 29 \]
\[ x - y = 5 \]

Check using your graphing calculator.

19. Graph the system of quadratic inequalities.

\[ y > x^2 - 4 \]
\[ y \leq -x^2 \]
Check using your graphing calculator.