Part I. Problems in this section are mostly short answer and multiple choice. Little partial credit will be given. 4 points each.

1. Simplify \((2 - 3i)^2\) to \(a + bi\) form.

2. Find the domain of the function \(g(x) = \sqrt{3 - x}\).
   a) \((-\infty, 3) \cup (3, \infty)\)
   b) \((-\infty, 3)\)
   c) \((-\infty, 3]\)
   d) \((3, \infty)\)
   e) \([3, \infty)\)

3. Give the equation of a circle with radius 3 and center at \((-2, 5)\).

4. An open box is made from a 10cm by 20cm piece of cardboard by cutting a square of side \(x\) from each corner and folding up the edges. Find the volume of the box in terms of \(x\).
   a) \(v(x) = 200x^3\)
   b) \(v(x) = x(10 - 2x)(20 - 2x)\)
   c) \(v(x) = 200 - x^3\)
   d) \(v(x) = x(10 - x)(20 - x)\)
5. Let $f(x) = 4x - 3$ and $g(x) = x^2 + 1$.
   
   a) Find and simplify $(f - g)(x)$.

   b) Find and simplify $(f \circ g)(-3)$.

6. Solve: $\frac{7}{x-4} + \frac{5}{x+4} = \frac{12}{x^2-16}$

7. Find the equation of the line passing through the points (2, -3) and (-5, 6). Write your final answer in slope-intercept form.
8. Let \( g(x) = 6x - x^2 \). Find and simplify \( g(2p) \).

\[
g(2p) = 
\]

9. Solve: \( A = 2(lw + wh + lh) \) for \( w \)

10. Solve \( -1 \leq 4 - x < 7 \). Express solution in interval form.

11. Graph the functions. Label all intercepts and asymptotes. List equations of asymptotes.

\[
f(x) = e^{-x} \quad \quad \quad g(x) = \ln(x - 2)
\]

Equation of Asymptote:__________

Equation of Asymptote:__________
12. Evaluate each.

a) \( \log_5 125 = \) \[ \square \]

c) \( \log(0.01) = \) \[ \square \]

b) \( \log_{16} 4 = \) \[ \square \]

d) \( \ln e^{\frac{3}{7}} = \) \[ \square \]

Part II. There are 10 problems in this section. Partial credit will be awarded. Show all work. 12 pts. each.

13. Solve: \( x^4 - 6x^2 - 27 = 0 \)

Solution(s): \( x = \) \[ \square \]

14. For the function below, find the vertex, the axis of symmetry, and the maximum or minimum value. \( f(x) = -x^2 + 6x - 7 \)

a) The vertex is \( (\) \[ \square \], \[ \square \)\).

b) The axis of symmetry is \( x = \) \[ \square \].

c) Does \( f(x) \) have a maximum or a minimum value?

\[ \square \] Maximum \[ \square \] Minimum

d) Maximum/minimum value = \[ \square \].
15. Solve for \( x \). When necessary, express answer using log or ln form.
   
a) \( \left( \frac{1}{2} \right)^x \cdot 8^{x-1} = 4 \) 
   
b) \( e^{2x} = 4 \)

16. Sketch the graph of the function \( f(x) = (x + 3)^2 (2x - 5)(x + 1) \).
   Label all intercepts.
   
a) find \( y \)-intercept
   
b) Find zeros and state multiplicities.
   
c) State ending behavior

17. Find a formula for the inverse given \( f(x) = \frac{\sqrt{2x - 1}}{5} \).

\[ f^{-1}(x) = \text{__________} \]
18. Strontium 90 is radioactive material that decays according to the equation \( A = A_0 e^{-0.0244t} \), where \( A_0 \) is the initial amount present and \( A \) is the amount present at time \( t \) (in years). If the initial amount is 100 grams, how long will it take for the 100 grams to be reduced to 80 grams? Leave your answer in exact form (in terms of logarithms).

19. Find all asymptotes, \( x \)-intercepts, and \( y \)-intercepts for the graph \( f(x) = \frac{2x - 1}{x + 3} \).
   a) The equation of the vertical asymptote(s) is/are \( x = \) ________.
   b) The equation of the horizontal asymptote(s) is/are \( y = \) ________.
   c) The \( x \)-intercept is at the point ______________.
   d) The \( y \)-intercept is at the point ______________.
   e) Sketch the graph of \( f(x) \). Label all intercepts and asymptotes.
20. Solve for $x$: \[\log_2(4x + 6) - \log_2(x + 5) = 3\]

21. Solve $5 + \sqrt{x + 7} = x$. Check all solutions.

22. Solve $x^3 - 4x > 0$. Express in interval form.
Part III. There are 6 problems in this section. Choose any 4. Indicate in the boxes the problems you want graded. 8 points each.

☐ Grade

23. The points (−1, 4) and (3, 8) are the endpoints of the diameter of a circle.
   a) State the center and the radius.
      
   b) Write the equation of the circle.

☐ Grade

24. Given the polynomial $g(x) = x^3 - x - 6$, find all zeros (real and complex). First state all possible rational zeros.
25. Solve the system algebraically:

\[
\begin{align*}
  x - 2y + 3z &= 7 \\
  2x + y + z &= 4 \\
  -3x + 2y - 2z &= -10
\end{align*}
\]

26. Solve \( \frac{x}{x-3} > 0 \). Express in interval form.
27. Simplify the difference quotient \( \frac{f(x + h) - f(x)}{h} \) for \( f(x) = x^2 - 2x + 5 \).

28. The height measured in feet of a rocket \( t \) seconds after it has been launched is given by

\[
S(t) = -16t^2 + 12t , \text{ s in feet.}
\]

Find the time(s) at which the rocket reaches a height of 1 foot. Show your work algebraically.