MULTIPLE CHOICE. 3 points each

1. Simplify the expression \( \left( \frac{a^{-3}b^{-4}}{a^{-2}b^3} \right)^3 \) so that none of the exponents are written as negative.

   a) \( \frac{1}{a^3b^9} \)  
   b) \( a^2b^6 \)  
   c) \( a^7b^{10} \)  
   d) \( \frac{1}{a^3b^9} \)

2. The equation of the line passing through (15, -8) and perpendicular to the line \( y = \frac{5}{3}x - 7 \) is:

   a) \( y = -\frac{3}{5}x + 1 \)  
   b) \( y = \frac{3}{5}x - 17 \)  
   c) \( y = \frac{5}{3}x - 8 \)  
   d) \( y = -\frac{5}{3}x + 17 \)

3. Which of the following is the domain of the function \( f(x) = \sqrt{x - 9} \)?

   a) \((9, \infty)\)  
   b) \([9, \infty)\)  
   c) \(x \neq 9\)  
   d) \(x = 2005\)

4. The function \( f(x) = -x^2 + 4x + 4 \) is:

   a) even  
   b) odd  
   c) odd and even  
   d) neither

5. If \( f(x) = \frac{2}{x} \), which of the following equals \( f^{-1}(x) \)?

   a) \( f^{-1}(x) = \frac{x}{2} + 4 \)  
   b) \( f^{-1}(x) = \frac{2 + 3x}{x} \)  
   c) \( f^{-1}(x) = \frac{2}{x} \)  
   d) \( f^{-1}(x) = 2 - x \)

6. Which of the following is equal to \( 3 \log x - 3 \log y \)?

   a) \( \log (3x - 3y) \)  
   b) \( \log \left( \frac{3x}{3y} \right) \)  
   c) \( \log \left( \frac{x^3}{y^3} \right) \)  
   d) \( \log (x^4 - y^3) \)

7. Assume that \( x, y, z, \) are positive. Which of the following is equal to \( \log \left( \frac{\sqrt{x^2 + y^2}}{\sqrt{z^2}} \right)^2 \)?

   a) \( \log (x^2 + y^2) \log (z) \)  
   b) \( 2 \log (y) + \log (z) \)  
   c) \( 2 \log (y) + \log (z) - \frac{1}{2} \log (x) \)
   d) \( 2 \log (y) + \log (z) - \sqrt{\log (x)} \)

8. Which of the following are equations of the vertical asymptotes of \( F(x) = \frac{2y^2}{x^2 - 1} \)?

   a) \( x = 2 \)  
   b) \( y = 1 \)  
   c) \( y = -1 \)  
   d) \( x = 1 \)  
   e) \( z = -1 \)
9. Match each function with the horizontal asymptote(s) that would appear on its graph.

\[ f(x) = \frac{3x^2 + 2}{2x^3} \quad \text{No horizontal asymptote} \]

\[ g(x) = \frac{1}{2x^3 + 1} \quad y = 0 \]

\[ h(x) = \frac{3x^2 + 2}{2x^2 + 1} \quad y = \frac{3}{2} \]

II Each subquestion is worth 4 points unless mentioned otherwise. Please write the answer in the place provided. For partial credit, show your work.

1. Write the given complex number in the standard form \(a + bi\).
   i. \((5 - 5i)(3 - 4i)\)

   **Answer:**

   ii. \(\frac{5 - 5i}{3 + 4i}\)

   **Answer:**

2. Solve the inequality \(1 < 3x + 4 \leq 13\) and write your solution in the interval notation.

   **Answer:**
3. Solve the inequality $|2x - 3| < 5$ and write your solution in interval notation.

Answer:

4. If $f(x) = x^2 - x + 1$ and $g(x) = 2x + 1$, determine
   i. $f(2) + 5$

Answer:

ii. $g(f(x))$

Answer:
5. Let \( g(x) = \begin{cases} \quad 2x + 1 & \text{if } x < 2 \\ \quad 3 - x & \text{if } x \geq 2 \end{cases} \). Evaluate \( g(0) \) and \( g(4) \).

Answer: \( g(0) = \) \( g(4) = \)

6. Write the zeros of \( P(x) = (x - 4)^2(x + 2)(x + 5)^2 \). State the multiplicity of each zero.

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<th>zero</th>
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7. Consider the line that passes through \((6, -4)\) and \((1, 5)\).

i. Find its slope.

Answer:

ii. Find the equation of this line and write it in the form \( y = mx + b \).

Answer:
8. Completely factor the expression: $8x^3 + 10x - 25$.

Answer:

9. The perimeter of a rectangle is 140 feet. Label the width of the rectangle $w$, the length $l$ and the area $A$.

i. Write $w$ as a function of $l$.  

**Answer:*** $w = \phantom{0}$

ii. Write $A$ as a function of $l$.  

**Answer:*** $A = \phantom{0}$

Note: Show all your work for full credit.

10. Solve the inequality \( \frac{(x+2)(x-3)}{x-5} \leq 0 \) and write your solution in the interval notation.

**Answer:*** \( x \in \phantom{0} \)