PART 1. This portion of the exam is to test basic calculation skills toward a correct solution. The questions are multiple choice with “None of these” as a possible valid choice. No partial credit is given in this section, so work very carefully. Value: 7 points each

1. \( \lim_{x \to 2} \frac{x^2 - 4x + 4}{x^2 + x - 6} = \)
   
   \[ \begin{array}{cccc}
   \text{A) } & 2/3 & & \text{B) } 4/5 & & \text{C) } 1 & & \text{D) } -1 & & \text{E) } -4/5 \\
   \text{F) } & 0 & & \text{G) } -2/3 & & \text{H) } \text{The limit does not exist} & & \text{I) None of these} \\
   \end{array} \]

2. \( \lim_{x \to 25} \frac{5 - \sqrt{x}}{25 - x} = \)
   
   \[ \begin{array}{cccc}
   \text{A) } & 1/5 & & \text{B) } -1 & & \text{C) } 1/10 & & \text{D) } 1 \\
   \text{E) } & 2/5 & & \text{F) } -1 & & \text{G) } -1/5 & & \text{H) None of these} & & \text{I) Limit does not exist} \\
   \end{array} \]

3. The domain of the function \( f(x) = \sqrt{\frac{2 - 3x}{1 + x}} \) is
   
   \[ \begin{array}{cccc}
   \text{A) } & x < -2 \text{ and } x > 3 & & \text{B) } -2/3 < x < 1 & & \text{C) } x \leq -2/3 \text{ and } x \geq 1 & & \text{D) } -1 \leq x \leq 2/3 \\
   \text{E) } & -1 < x < 2/3 & & \text{F) } -1 \leq x \leq 3/2 & & \text{G) all real numbers} & & \text{H) None of these} \\
   \end{array} \]
4. \( \lim_{x \to 0} \frac{\sin(x^2) \cos(2x)}{x^2} = \)

A) Does not exist   B) 2   C) 1   D) 0
E) -1   F) 0   G) None of these

5. \( \lim_{x \to 1} \frac{|x^2 - 1|}{x^2 - 3x + 2} = \)

A) Does not exist   B) 1/2   C) 2   D) 1   E) -2
F) 0/0   G) 0   H) None of these

6. The graph of the quadratic function \( y = 3x^2 + 2x - 1 \) has a horizontal tangent line when

A) \( x = -1 \)   B) \( x = -3 \)   C) \( x = -1/3 \)   D) \( x = -2/3 \)   E) \( x = 3 \)
G) \( x = 2/3 \) and \( x = 1 \)   H) \( x = 3/2 \)   I) None of these
Part 2: This portion of the exam will be graded on a partial credit basis. Answers without supporting work shown on the paper will receive NO credit.

7. Consider the functions \( f(x) = \sin(3x) \) and \( g(x) = \sqrt{x^2 + \pi^2} \).
   (a) (4 points) Compute the following values
   \[
   f(g(0)) = \quad g(f(0)) =
   \]
   (b) (5 points) Compute the limit \( \lim_{x \to 0} \frac{f(x)}{g(x)} \).

8. Consider the function \( g(x) = 4 - x^2 \).
   a) (5 points) Find the equation of the line tangent to the graph of the function at a point \( P(k, 4 - k^2) \).
   b) (4 points) Determine the value of \( k \) for which the tangent line found in part (a) will pass through the point \( Q(5/2, 0) \). part a).
9. (10 points) Consider the function

\[ f(x) = \begin{cases} 
3x^2 + 2cx, & \text{if } x < 1; \\
2x + 5c, & \text{if } x > 1;
\end{cases} \]

Determine the value of \( c \) that would make it possible to define \( f(1) \) so that \( f(x) \) would be continuous at \( x = 1 \). Explain and find \( f(1) \).

10. (10 points) Let \( f(x) = \sqrt{x} - 3 \). For any \( x > 3 \), find the limit

\[
\lim_{h \to 0} \frac{f(x + h) - f(x)}{h} = \]

\[
\]
11. (10 points) Evaluate the limit

\[ \lim_{\theta \to 0} \frac{1 - \cos(\theta)}{\sin(2\theta)} = \]

12. (10 points) Apply the intermediate value property of continuous functions to show that the equation \( x^3 - 4x + 1 \) has at least one solution in the interval \([-3, 3]\).