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**GOOD LUCK!**

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Please make sure to list the correct section number on the front page of your exam. In case you forgot your section number, consult the following table.

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You may use the following formula for the derivative of a quadratic function.

If \( p(x) = Ax^2 + Bx + C \), then \( p'(x) = 2Ax + B \).
Multiple Choice Questions

Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page on this exam
and in the corresponding questions that follow.

1. Find an equation for the line with slope 2 passing through the point \((x, y) = (7, 6)\).

   Possibilities:
   (a) \(y = 2x - 8\)
   (b) \(y = 2x - 14\)
   (c) \(y = (6/7)x + 2\)
   (d) \(y = 2x + 6\)
   (e) \(y = 7x + 6\)

2. Solve the equation \(x^3 + 3xy + 6y = 8\) for \(y\) in terms of \(x\).

   Possibilities:
   (a) \(y = \frac{x^3 - 8}{3x + 6}\)
   (b) \(y = \frac{8 - x^3}{3x + 6}\)
   (c) \(y = 8 - x^3 - 3x - 6\)
   (d) \(y = \frac{3x + 6}{8 - x^3}\)
   (e) \(y = \frac{3x + 6}{x^3 - 8}\)

3. Find the point where the curve \(y + 25 = (x - 7)^2\) intersects the \(y\)-axis.

   Possibilities:
   (a) \((24, 0)\)
   (b) \((0, -24)\)
   (c) \((0, 24)\)
   (d) \((32, 0)\)
   (e) \((-18, 0)\)
4. Evaluate \( f(5) \) when \( f(x) \) is given by the piecewise definition

\[
f(x) = \begin{cases} 
  x^2 - 5 & \text{if } x \leq 1 \\
  8x - 2 & \text{if } 1 < x \leq 3 \\
  x^2 - 4x & \text{if } 3 < x 
\end{cases}
\]

Possibilities:
(a) \(-4\)
(b) \(63\)
(c) \(20\)
(d) \(38\)
(e) \(5\)

5. A train travels from city A to city B, then travels from city B to city C. The train leaves city A at time 11:00am and arrives at city B at 12:30pm. The train leaves city B at 2:00pm and arrives at city C at 5:00pm. The average velocity of the train, while travelling from A to B, was 54 miles per hour. The average velocity of the train, while travelling from B to C, was 58 miles per hour. What was the average velocity of the train from city A to city C, including the wait at city B?

Possibilities:
(a) 56 miles per hour
(b) \((87/2)\) miles per hour
(c) \((85/2)\) miles per hour
(d) 2 miles per hour
(e) 112 miles per hour

6. Find the average rate of change of \( f(x) = \sqrt{x + 3} \) from \( x = 6 \) to \( x = 46 \).

Possibilities:
(a) \(-\frac{8}{23}\)
(b) 4
(c) \(-\frac{1}{10}\)
(d) \(\frac{43}{46}\)
(e) \(\frac{1}{10}\)
7. Find the average rate of change of $f(x) = 7x^2 + 5$ from $x = 3$ to $x = 3 + h$.

**Possibilities:**
(a) $h$
(b) $-7h - 42$
(c) $-7h^2 - 42h$
(d) $7h + 42$
(e) $7h^2 + 42h$

8. Find a value of $x$ so that the instantaneous rate of change of $f(x) = 4x^2 + 8$ at $x$ is equal to 48.

**Possibilities:**
(a) $x = 5$
(b) $x = 6$
(c) $x = 7$
(d) $x = 8$
(e) $x = 9$

9. Let $f(x) = 7x^2 + 4x + 5$. Find a value $c$ between $x = 0$ and $x = 4$, so that the average rate of change of $f(x)$ from $x = 0$ to $x = 4$ is equal to the instantaneous rate of change of $f(x)$ at $x = c$.

**Possibilities:**
(a) 0
(b) 1
(c) 2
(d) 3
(e) 4
10. If \( \lim_{x \to 13} f(x) = 5 \) and \( \lim_{x \to 13} g(x) = 3 \), then what is the value of \( \lim_{x \to 13} \frac{(x + 11)(f(x) + 1)}{g(x)} \)?

**Possibilities:**

(a) \( \frac{(13 + 11)(5 + 1)}{3} \)

(b) 0

(c) \( \frac{(13)(5)}{3} \)

(d) the limit is infinity or does not exist

(e) \( \frac{5}{3} \)

11. Find the limit

\[ \lim_{t \to 0^+} \frac{34\sqrt{t}}{t} \]

**Possibilities:**

(a) 34

(b) 0

(c) \( \frac{17}{\sqrt{2}} \)

(d) 17

(e) This limit either tends to infinity or this limit fails to exist

12. Find the limit

\[ \lim_{x \to 0} \left( \frac{13}{x} + \frac{7x - 13}{x} \right) \]

**Possibilities:**

(a) 7

(b) 0

(c) 1

(d) 13

(e) This limit does not exist.
13. Compute

\[ \lim_{n \to \infty} \frac{3n^2 - 8n + 6}{7n^2 + 5n - 5} \]

If the limit tends to ±∞, select “Limit does not exist”.

Possibilities:
(a) 3
(b) 0
(c) −8
(d) 3/7
(e) Limit does not exist

14. For the function

\[ f(x) = \begin{cases} 
|5 + x| & \text{if } x < -2 \\
\sqrt{x^2 + 1} & \text{if } -2 \leq x < 3 \\
9x^2 + x + 2 & \text{if } 3 \leq x 
\end{cases} \]

find \( \lim_{x \to 4^+} f(x) \)

Possibilities:
(a) 9
(b) 150
(c) 86
(d) \( \sqrt{17} \)
(e) \( \sqrt{10} \)

15. The graph of \( y = f(x) \) is shown below. Compute \( \lim_{x \to -2^+} f(x) \).

Possibilities:
(a) 3
(b) −2
(c) −1
(d) 0
(e) −3
16. Suppose $f(x) = Ax^3$ for $x < 2$ and $f(x) = 14 - Ax$ for $x \geq 2$. Find a value of $A$ such that the function $f(x)$ is continuous at the point $x = 2$.

**Possibilities:**

(a) 1
(b) $\frac{6}{5}$
(c) $\frac{7}{5}$
(d) $\frac{8}{5}$
(e) $\frac{9}{5}$

17. Find the value of $m$ which makes $f(x)$ differentiable everywhere, where

$$f(x) = \begin{cases} 
  x^2, & \text{if } x \leq 2; \\
  m(x - 2) + 4, & \text{if } x > 2 
\end{cases}$$

**Possibilities:**

(a) 4
(b) 5
(c) 6
(d) 7
(e) 8

18. For the function $f(x) = 6x^2 + 5x + 9$, find the equation of the tangent line to graph of $f$ at $x = -3$.

**Possibilities:**

(a) $y = 48x + 113$
(b) $y = x^3 + 17$
(c) $y = -31x + 48$
(d) $y = 48$
(e) $y = -31x - 45$
19. Determine the value of \( f'(1) \) from the graph of \( f(x) \) given here:

**Possibilities:**

(a) \( f'(1) = -1 \)
(b) \( f'(1) = 0 \)
(c) \( f'(1) = 1 \)
(d) \( f'(1) = 3 \)
(e) \( f'(1) = -3 \)

20. Determine the \( x \) values where the derivative is not defined (that is, the points where the function is not differentiable) on the graphed here:

**Possibilities:**

(a) \( x = -1 \) and \( x = 3 \)
(b) \( x = -2 \) and \( x = 1 \)
(c) \( x = -2 \) and \( x = 3 \)
(d) \( x = -3 \) and \( x = 2 \)
(e) \( x = -3 \) and \( x = 1 \)
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