

Exam version: 33

**Part B: Multiple Choice**

**INSTRUCTIONS:** Choose the best answer to each of the following questions. Fill in the appropriate circle on the scantron sheet with a pencil **AND** circle your answer in the booklet. You may keep this booklet when the exam concludes. There are 13 multiple choice problems.

1. Evaluate the following limit:

$$\lim_{x \rightarrow 7} \frac{-x - 7}{(x - 7)^2}.$$

- (a)  $\infty$
- (b)  $\frac{1}{14}$
- (c) 14
- (d)  $-\infty$  \*\*\*
- (e) 0

2. For which value(s) of the constant  $k$  will the function  $f(x) = \frac{(x+8)(x-k)}{(x-9)(x+2)^2}$  have **exactly one** vertical asymptote (i.e., infinite discontinuity)?

- (a) There are no such values of  $k$ .
- (b)  $k = -8$  only
- (c)  $k = -2$  only
- (d)  $k = 9$  or  $k = -2$
- (e)  $k = 9$  only \*\*\*

Exam version: 33

3. Evaluate the following limit:

$$\lim_{x \rightarrow -2} \frac{|-2x - 8| - 4}{x + 2}.$$

(a) 0

(b) -4

(c) 2 \*\*\*

(d)  $\frac{3}{2}$

(e)  $\infty$

4. Which of the following statements is **FALSE**?

(a)  $\lim_{x \rightarrow \infty} \frac{1}{x^2} = 0$

(b)  $\lim_{x \rightarrow -\infty} \frac{1}{(x - 4)^3} = 0$

(c)  $\lim_{x \rightarrow \infty} \frac{1}{(x - 4)^6} = 0$

(d)  $\lim_{x \rightarrow -\infty} \frac{-x}{\sqrt{9x^2 + 4}} = \frac{1}{3}$

(e)  $\lim_{x \rightarrow \infty} \frac{-x}{\sqrt{9x^2 + 4}} = \frac{1}{3}$  \*\*\*

Exam version: 33

5. Consider  $h(x) = \frac{1}{2} \sin(2x) + \frac{2}{x}$ . Which of the following is equal to  $h'(x)$ ?

(a)  $\cos(2x) - 2$

(b)  $2x \cos(x^2) - \frac{2}{x^2}$

(c)  $2 \cos(2x) + \frac{2-x}{x^2}$

(d)  $2 \cos(x) + 2 \ln(x)$

(e)  $\cos(2x) - \frac{2}{x^2}$  \*\*\*

6. Let

$$f(x) = \frac{\ln(x)}{e^x}.$$

Which of the following equals  $f'(x)$ ?

(a)  $e^x \ln(x) + \frac{e^x}{x}$

(b)  $\frac{\frac{e^x}{x} - \ln(x)e^x}{e^{2x}}$  \*\*\*

(c)  $xe^x$

(d)  $\frac{e^x}{x} + xe^{x-1} \ln(x)$

(e)  $\frac{\frac{e^x}{x} - xe^{x-1} \ln(x)}{e^x}$

Exam version: 33

7. Let  $f(x)$  be a function that is differentiable for all values of  $x$ . The equation of the tangent line of  $f$  at the point  $x = 2$  is  $y = 5x - 4$ . Which of the following statements is **TRUE**?

(a)  $f(2) = 5$  and  $f'(2) = 6$

(b)  $f(2) = -4$  and  $f'(2) = 5$

(c)  $f(2) = 5$  and  $f'(2) = -4$

(d)  $f(2) = 6$  and  $f'(2) = 5$  \*\*\*

(e) There is not enough information given to determine the values of  $f(2)$  and  $f'(2)$ .

8. Suppose  $f(x)$  is continuous for all values of  $x$  and

$$f(1) = 1, f(3) = 4, f(5) = 6, \text{ and } f(7) = -1.$$

On which of the following intervals does the Intermediate Value Theorem guarantee that there exists a number  $c$  such that  $f(c) = 0$ ?

(a)  $(1, 6)$

(b)  $(-1, 6)$

(c)  $(1, 4)$

(d)  $(3, 5)$

(e)  $(5, 7)$  \*\*\*

Exam version: 33

9. Let  $a$  be a constant and let  $f(x)$  be a function with domain  $(-\infty, \infty)$ . Assume that  $f$  satisfies

$$\lim_{x \rightarrow 2^-} \frac{f(x) - f(2)}{x - 2} = 4 + a, \quad \text{and} \quad \lim_{x \rightarrow 2^+} \frac{f(x) - f(2)}{x - 2} = 9. \quad (1)$$

Which of the following statements is **TRUE**?

- (a)  $f'(2) = \frac{a+4}{9}$ .
- (b) If  $a \neq 5$ , then  $f$  is not continuous at  $x = 2$ .
- (c) If  $a = 5$ , then  $f'(2) = 9$ . \*\*\*
- (d) If  $a = 5$ , then  $f'(x) = 9$  for all values of  $x$ .
- (e)  $f'(2)$  does not exist for all values of  $a$ .

10. Consider the function

$$f(x) = \begin{cases} \frac{(x+2)(x+3)}{(x-2)(x+1)} & \text{if } x \geq -3 \\ 5 & \text{if } x < -3. \end{cases}$$

Which of the following statements is **FALSE**?

- (a)  $f$  has a removable discontinuity at  $x = -1$  \*\*\*
- (b)  $f$  has an infinite discontinuity at  $x = 2$
- (c)  $f$  is continuous at  $x = 3$
- (d)  $f$  has a jump discontinuity at  $x = -3$
- (e) For every number  $N$  such that  $f(1) < N < f(0)$ , there exists a number  $c$  in the interval  $(0, 1)$  such that  $f(c) = N$ .

Exam version: 33

11. What is the slope of the tangent line to the curve  $x^3 + 4xy + 2y^2 = 17$  at the point  $(1, 2)$ ?

(a)  $-\frac{11}{12}$  \*\*\*

(b)  $\frac{9}{14}$

(c)  $\frac{11}{15}$

(d) 0

(e)  $-\frac{15}{14}$

12. Let  $f(x) = e^3 + x^x + x^3 + 3^x$ . Which of the following is the derivative of  $f(x)$ ?

(a)  $3e^2 + \ln(3)3^x + 3x^2 + xx^{x-1}$

(b)  $3^x \ln(3) + 3x^2 + x^x(\ln(x) + 1)$  \*\*\*

(c)  $3^x + 3x^2 + \ln(x)x^x + x^x$

(d)  $3^x + 3x^2 + \ln(x)x^x$

(e)  $e^3 + \ln(3)3^x + 3x^2 + x^x$

Exam version: 33

13. Consider  $f(x) = e^{x^2}$  on the domain  $[0, \infty)$ . Which of the following is equal to  $(f^{-1})'(e^{16})$ ?

(a)  $\frac{1}{4e^4}$

(b)  $4e^4$

(c)  $\frac{1}{(e^{-16})(2xe^{x^2})}$

(d)  $\frac{1}{8e^{16}}$  \*\*\*

(e)  $(f^{-1})'(e^{16})$  does not exist.

**Extra page for rough work. This page will not be graded.**

**Exam version: 33**



**Extra page for rough work. This page will not be graded.**

**Exam version: 33**