

Simon Fraser University
Department of Mathematics
Math 154-3, Calculus I for Biological Sciences
Test 1

Instructor: E. Lee

2 Oct 2002

Last Name

Student Number

Given Names

1. Do not turn over this cover page until instructed to do so.
2. No calculators allowed.
3. Full marks will be awarded for correct, complete and well-organized solutions. Except for Question 1, full justification of answers is required, and requested methods must be used.
4. There are 4 questions in this test. You have 50 minutes to complete this test.

For examiner's use only

Question	Marks
1	/8
2	/3
3	/5
4	/4
Total	/20

1. [8 marks] Multiple choice questions. No justification is required.

(a) The equation of a circle with center $(-1, 2)$ and radius $\sqrt{3}$ is

(A) $(x - 1)^2 + (y + 2)^2 = 3$

(B) $(x - 1)^2 + (y + 2)^2 = \sqrt{3}$

(C) $(x + 1)^2 + (y + 2)^2 = 3$

(D) $(x - 1)^2 + (y + 2)^2 = \sqrt{3}$

(E) $(x + 1)^2 + (y - 2)^2 = 3$

Answer

(b) Suppose that

$$f(x) = \frac{1}{x+1}, \quad x \neq -1$$

and

$$g(x) = 2x^2, \quad -\infty < x < \infty.$$

What is the domain of $(f \circ g)(x)$?

(A) $x \neq -1$

(B) $-\infty < x < \infty$

(C) $-\infty < x < -1$

(D) $-1 < x < \infty$

(E) $-\infty < x < -1$ and $-1 < x < \infty$

Answer

- (c) Evaluate the numerical value of

$$\frac{\log_3 4 + \log_3 2}{\log_3 64}$$

- (A) $1/2$
- (B) $1/8$
- (C) $3/32$
- (D) $3/64$
- (E) none of the above

Answer

- (d) Evaluate

$$\lim_{x \rightarrow 0^-} \left(\frac{\pi + 5x - 2x^2}{1 - ex + 3x^2} \right).$$

- (A) $-2/3$
- (B) $2/3$
- (C) $-5/e$
- (D) π
- (E) $-\pi$

Answer

(e) The graph of

$$y = -f(x + 2)$$

is obtained from the graph of $y = f(x)$ by

- (A) first translating $y = f(x)$ to the left by 2 units, then reflecting about the x -axis.
- (B) first reflecting $y = f(x)$ about the y -axis, then translating to the left by 2 units.
- (C) first translating $y = f(x)$ to the right by 2 units, then reflecting about the x -axis.
- (D) first reflecting $y = f(x)$ about the x -axis, then translating to the right by 2 units.
- (E) first translating $y = f(x)$ to the left by 2 units, then reflecting about the y -axis.

Answer

(f) Evaluate $\lim_{x \rightarrow \frac{1}{2}^+} \frac{|1 - 2x|}{1 - 2x}$.

- (A) 0
- (B) 1
- (C) -1
- (D) 2
- (E) -2

Answer

(g) Let

$$f(x) = \begin{cases} \ln(ax) & \text{if } x > 1 \\ \pi & \text{if } x \leq 1 \end{cases}$$

What value must be assigned to a so that $f(x)$ is continuous at $x = 1$?

- (A) e^π
- (B) $\ln(\pi)$
- (C) e
- (D) π
- (E) $\pi + e$

Answer

(h) Where is the function

$$f(x) = \begin{cases} \frac{\cos x - 1}{x} & \text{if } x \neq 0 \\ -1 & \text{if } x = 0 \end{cases}$$

continuous?

- (A) $x = 0$
- (B) $-\infty < x < \infty$
- (C) $-\infty < x < 0$
- (D) $0 < x < \infty$
- (E) $-\infty < x < 0$ and $0 < x < \infty$

Answer

2. [3 marks] Let

$$f(x) = \sin(5x)$$

Use the formal definition of the derivative to find $\frac{d}{dx}f(x)$.

Hint:

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

3. **(a)** [3 marks] Find the derivative of $y = 1 - x^3$ at $x = 2$. (Any methods accepted).

(b) [2 marks] Find the equation of the normal line at the point $(2, -7)$.

4. [4 marks] Use the intermediate value theorem to show that

$$e^x = \frac{3}{x}$$

has a solution for some $x > 0$.