

King Fahd University of Petroleum and Minerals
Department of Mathematics
Math 106
Exam 1
223
July 12, 2023
Net Time Allowed: 120 Minutes

USE THIS AS A TEMPLATE

Write your questions, once you are satisfied upload this file.

1. If $f(x) = 2 - 3x^2$, then $\lim_{h \rightarrow 0} \frac{f(3+h) - f(3)}{h} =$

- (a) -18
- (b) 18
- (c) 25
- (d) -25
- (e) -16

2. $\lim_{x \rightarrow 2} \frac{x^4 - 16}{x^2 - x - 2} =$

- (a) $\frac{32}{3}$
- (b) 0
- (c) ∞
- (d) $-\infty$
- (e) $\frac{8}{3}$

$$3. \lim_{x \rightarrow \infty} \left(\frac{1}{x+1} - \frac{2x - 6x^2 + 1}{3x^2 + x} \right) =$$

- (a) 2
- (b) -2
- (c) 0
- (d) ∞
- (e) $-\infty$

$$4. \lim_{x \rightarrow 2} \frac{(x^3 - 8)(x + 2)}{x^2 - 4} =$$

- (a) 12
- (b) 0
- (c) 8
- (d) 48
- (e) ∞

5. If

$$f(x) = \begin{cases} \sqrt{x+1}, & x > 3 \\ x^2 + kx + k - 3, & x \leq 3, \end{cases}$$

then the value of k that makes the function continuous everywhere is

- (a) -1
- (b) 1
- (c) 2
- (d) -2
- (e) 0

6. The function $f(x) = \frac{x^2 - x - 2}{x^4 - x^2}$ is discontinuous at

- (a) $x = 0$, $x = 1$ and $x = -1$
- (b) $x = 0$ and $x = 1$ only
- (c) $x = 1$ and $x = -1$ only
- (d) $x = 1$ only
- (e) $x = 0$ only

$$7. \lim_{h \rightarrow 0} \frac{(4+h)^2 + \sqrt{4+h} - 18}{h} =$$

- (a) $\frac{33}{4}$
- (b) 0
- (c) 8
- (d) $\frac{17}{2}$
- (e) $\frac{33}{2}$

8. The graph of $f(x) = \frac{1}{4}x^4 + x^3 + x^2$ has horizontal tangent line at

- (a) $x = -1$, and $x = 0$, and $x = -2$
- (b) $x = 0$, $x = -1$, and $x = 2$
- (c) $x = 0$, $x = -2$ only
- (d) $x = 2$, $x = 0$ only
- (e) $x = -1$, $x = -2$, $x = 2$

9. If a manufacturer's average-cost equation is $\bar{c} = 0.01q^2 - 0.1q$. Then the cost of producing the 11th unit approximately is

- (a) 1
- (b) 1.5
- (c) 2
- (d) 2.5
- (e) 3

10. A disc of metal is being heated. If the radius increased from 10 *cm* to 10.1 *cm*, then the approximate the change in the area

- (a) $2\pi \text{ cm}^2$
- (b) $\pi \text{ cm}^2$
- (c) $\frac{\pi}{2} \text{ cm}^2$
- (d) $3\pi \text{ cm}^2$
- (e) $4\pi \text{ cm}^2$

11. If the average cost function is given by

$$\bar{c} = 0.00002q^2 - 0.01q + 6 + \frac{20000}{q}.$$

Then the marginal cost when $q = 100$ is

- (a) 4.6
- (b) 11
- (c) 5.8
- (d) 11.2
- (e) 8.6

12. If the equation of the tangent line to the curve of $y = \frac{6}{x-1}$ at $x = 3$ is $y = ax + b$, then $a + b = \dots$

- (a) 6
- (b) -3
- (c) -6
- (d) 12
- (e) -12

13. If $y = (x^{2/3} + 3)(x^{-1/3} + 5x)$, then $y'(1) = \dots$

- (a) $\frac{68}{3}$
- (b) 15
- (c) $\frac{74}{3}$
- (d) 25
- (e) 40

14. If $f(x) = ee^x e^{x^2}$, then $f'(1) =$

- (a) $3e^3$
- (b) $2e^2$
- (c) e^3
- (d) e^2
- (e) $3e^5$

15. For the demand function $p = 10e^{-0.001q}$, then rate of change of the quantity (q) with respect to the price (p) at $q = 500$ is equal to

- (a) $-100\sqrt{e}$
- (b) $-10e^2$
- (c) $100e$
- (d) $-10\sqrt{e}$
- (e) $10\sqrt{e}$

16. If $y = (5u + 6)^3$ and $u = (x^2 - 1)^4$, then $\frac{dy}{dx}$ at $x = 1$ is equal to

- (a) 0
- (b) 5
- (c) 10
- (d) 15
- (e) 30

17. Suppose the demand function is given by

$$p = 100 - \sqrt{q^2 + 20}$$

then the marginal revenue when $q = 4$ is

(a) $\frac{274}{3}$

(b) $\frac{244}{3}$

(c) $\frac{200}{3}$

(d) $\frac{215}{3}$

(e) $\frac{400}{3}$

18. Let $y = \ln \sqrt[3]{\frac{x^3 - 1}{x^3 + 1}}$ then $\frac{dy}{dx}$ at $x = 2$ is equal to

(a) $\frac{8}{63}$

(b) $\frac{-1}{32}$

(c) $\frac{5}{64}$

(d) 0

(e) $-\frac{32}{27}$

19. The equation of the tangent line to the curve of $y = x \ln x - x$ at $x = e$ is

- (a) $y = x - e$
- (b) $y = x$
- (c) $y = x + e$
- (d) $y = ex + 1$
- (e) $y = ex - 1$

20. The slope of the tangent line to the curve of $y = \frac{1 - x^2}{5}$ at the point $(4, -3)$ is

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