

Name _____ ID # _____ Section # _____

The examination consists of **20** multiple choice questions, each worth 5 points. For each problem, please fill in the bubble on the scantron sheet and circle the correct answer on your examination.

**THE USE OF CALCULATORS IS NOT PERMITTED
IN THIS EXAMINATION.**

CHECK THE EXAMINATION BOOKLET BEFORE
YOU START. THERE SHOULD BE **20** PROBLEMS
ON **11** PAGES (INCLUDING THIS ONE).

1. What is the domain of the function $f(x) = \frac{\sqrt{x-1}}{x-2}$?

- a) $x \neq 1$, and $x \neq 2$
- b) $1 < x < 2$
- c) $1 \leq x$, and $x \neq 2$
- d) $2 \leq x$

2. The supply and demand functions for a certain commodity are

$$p = s(x) = x^2 + 4x + 10,$$
$$p = d(x) = 60 - x.$$

Find the equilibrium production level \bar{x} and the equilibrium price \bar{p} .

- a) $\bar{x} = 5$ and $\bar{p} = 55$
- b) $\bar{x} = 10$ and $\bar{p} = 50$
- c) $\bar{x} = 5$ and $\bar{p} = 50$
- d) $\bar{x} = 8$ and $\bar{p} = 52$

3. A rectangular garden is to have area 1,000 sq.ft. For the front side, fence costing \$3 per foot will be used. For the other three sides, fence costing \$2 per foot will be used. Let x denote the length of the front side, and express the total cost $C(x)$ as a function of x .

a) $C(x) = 6x + \frac{2000}{x}$

b) $C(x) = 5x + \frac{4000}{x}$

c) $C(x) = 5x^2 - 4000x$

d) $C(x) = \frac{5x + 2000}{x}$

4. If $f(x) = \frac{1}{x-1}$ and $g(x) = \sqrt{x^2+9}$, determine the value of $f \circ g(4)$.

a) $f \circ g(4) = \frac{1}{2}$

b) $f \circ g(4) = \frac{1}{4}$

c) $f \circ g(4) = 4$

d) $f \circ g(4) = \frac{\sqrt{82}}{3}$

5. Find $A = \lim_{x \rightarrow 2} \frac{x-2}{x^2+1}$ and $B = \lim_{x \rightarrow 2} \frac{x-2}{x^2+x-6}$.

a) $A = \frac{3}{2}$ and B does not exist.

b) $A = -\frac{3}{2}$ and $B = 3$

c) $A = 0$ and $B = \frac{1}{5}$

d) Neither A nor B exists.

6. Find $A = \lim_{x \rightarrow 1^+} \frac{1+x}{1-x}$ and $B = \lim_{x \rightarrow \infty} \frac{x^3 - 2x^2 + x - 1}{2x^3 + 5}$.

a) $A = 0$ and $B = 2$

b) $A = 0$ and $B = \frac{1}{2}$

c) A does not exist, and $B = \frac{1}{2}$

d) Neither A nor B exists.

7. Find all discontinuities of the function

$$f(x) = \begin{cases} x^2 - 1 & \text{if } x \leq 0 \\ \frac{1}{x-1} & \text{if } x > 0 \text{ and } x \neq 1 \\ 1 & \text{if } x = 1 \end{cases}$$

- a) f has no discontinuities.
- b) f is discontinuous at $x = 0$ and at $x = 1$.
- c) f is discontinuous only at $x = 0$.
- d) f is discontinuous only at $x = 1$.

8. Find $\frac{d}{dx}(2x^3 - 5\sqrt{x})$.

- a) $6x^2 - \frac{5}{2\sqrt{x}}$
- b) $3x^2 - \frac{5}{2}\sqrt{x}$
- c) $6x^2 - \frac{10}{\sqrt{x}}$
- d) $5x^2 - \frac{1}{2\sqrt{x}}$

9. Find $\frac{d}{dx}(x^3 + 8)^{\frac{1}{3}}$.

a) $\frac{1}{3(x^3 + 8)^{\frac{2}{3}}}$

b) $\frac{x^2}{(x^3 + 8)^{\frac{2}{3}}}$

c) $-\frac{2}{3(x^3 + 8)^{\frac{1}{3}}}$

d) $\frac{1}{3}(3x^2)^{\frac{1}{3}}$

10. If $g(t) = \frac{t}{t+1}$, find $g'(2)$.

a) $\frac{2}{9}$

b) $\frac{2}{3}$

c) $\frac{1}{9}$

d) $-\frac{2}{9}$

11. Find and simplify $\frac{d}{dt} [t^2(t^3 + 5)^{10}]$.

a) $2t(3t^2)^{10}$

b) $20t(t^3 + 5)^9$

c) $(t^3 + 5)^9(4t^4 + 6t)$

d) $(t^3 + 5)^9(32t^4 + 10t)$

12. Find $\frac{dy}{dx}$ if $y = \left(\frac{x}{x+1}\right)^3$.

a) $3\left(\frac{x}{x+1}\right)^2$

b) $\frac{3x^2}{(x+1)^4}$

c) $\frac{3x^2}{x+1}$

d) $\frac{3}{(x+1)^2}$

13. The revenue and cost for producing and selling x items are

$$\begin{cases} R(x) = -0.04x^2 + 800x, \\ C(x) = 200x + 300,000. \end{cases}$$

Find the marginal profit function.

- a) $P'(x) = 600 - 0.08x$
- b) $P'(x) = 300,000 - 0.16x$
- c) $P'(x) = 0.04x - 400$
- d) $P'(x) = -0.04x^2 + 600x + 300,000$

14. If $f(x) = \sqrt{x+1}$, what is the value of

$$\lim_{h \rightarrow 0} \frac{f(3+h) - f(3)}{h}?$$

- a) $\frac{1}{4}$
- b) $\frac{1}{2}$
- c) 2
- d) The limit does not exist.

15. Find the equation of the line tangent to the graph of

$$f(x) = 1 + \sqrt{x}$$

at the point $(4, 3)$.

a) $y = 4x - 13$

b) $y = 2x - 5$

c) $y = \frac{1}{2}x - 1$

d) $y = \frac{1}{4}x + 2$

16. If $y = \frac{16}{t^3}$, find the instantaneous rate of change of y per unit change of t when $t = 2$.

a) 3

b) -4

c) 4

d) -3

17. Find the second derivative y'' if $y = x^3 + \sqrt{x}$.

a) $y'' = 3x^2 + \frac{1}{2\sqrt{x}}$

b) $y'' = 6x - \frac{1}{4x^{\frac{3}{2}}}$

c) $y'' = 6x + \frac{4}{\sqrt{x}}$

d) $y'' = 3x^2 - \frac{1}{4x^{\frac{3}{2}}}$

18. Find $\frac{d^3}{dx^3} \left(x^{\frac{1}{3}} \right)$.

a) $\frac{10}{27x^{\frac{8}{3}}}$

b) $\frac{28x^{\frac{10}{3}}}{27}$

c) $-\frac{2}{px^{\frac{5}{3}}}$

d) $\frac{2}{27x^{\frac{4}{3}}}$

19. If s and t are related by the equation

$$s^3t^3 - st = 6,$$

find $\frac{ds}{dt}$ when $t = 2$ and $s = 1$.

a) $\frac{ds}{dt} = -\frac{1}{2}$

b) $\frac{ds}{dt} = \frac{11}{2}$

c) $\frac{ds}{dt} = -\frac{5}{11}$

d) $\frac{ds}{dt} = \frac{1}{4}$

20. Suppose $x = f(p)$ gives the number of units of some commodity that can be sold at unit price p . If $f(100) = 5,000$ and $f'(100) = -25$, what is the elasticity of demand $E(100)$ at $p = 100$?

a) $E(100) = 2$

b) $E(100) = \frac{2}{5}$

c) $E(100) = \frac{1}{2}$

d) $E(100) = \frac{5}{2}$

21. Key: 1-c, 2-a, 3-b, 4-b, 5-c, 6-c, 7-d, 8-a, 9-b, 10-c, 11-d, 12-b, 13-a, 14-a, 15-d, 16-d, 17-b, 18-a, 19-a, 20-c.