

ANSWERS

I. Limits. 1. a) 5; b) -3; c) $-x^2$. 2. $\lim_{x \rightarrow 5^-} f(x) = 3$; $\lim_{x \rightarrow 5^+} f(x) = -2$; $\lim_{x \rightarrow 5} f(x)$ does not exist.

III. Derivatives

a) $f'(x) = 20x^4 + x^3 - \frac{1}{\sqrt{x}} - 4x^{\frac{3}{2}} - \frac{2}{3}x^{\frac{1}{3}} + 1$; b) $f'(x) = \frac{-4x}{(x^2 - 1)^2}$; c) $f'(x) = 4(3x^2 - 5x + 1)^3(6x - 5)$;

d) $f'(x) = \frac{2x - 5}{2\sqrt{x^2 - 5x - 10}}$; e) $f'(x) = \frac{-20(x + 4)^4}{x^6}$; f) $f'(x) = 6x^2 - 3e^{2x} - 6xe^{2x}$;

g) $f'(x) = \ln x$; h) $f'(x) = \frac{x}{x^2 + 1}$; i) $f'(x) = 3e^{x^3} + (3x + 1)e^{x^3} \cdot 3x^2$;

j) $f'(x) = 3[2x^3 - (x^2 - 5)^4]^2 \cdot [6x^2 - 8x(x^2 - 5)^3]$; k) $f'(x) = \frac{1 + 5x}{x}$.

III. Graphing

2. a) $\max f(x) = 130$ at $x = 5$, $\min f(x) = -32$ at $x = 2$.
b) $\max f(x) = 6401$ at $x = 10$, $\min f(x) = 1$ at $x = 0$ and $x = 2$.

IV. Applications

1. a) \$6,967.67; b) \$6,972.25; c) 23.17y, 23.13y; d) 9.91y, 9.89y.

2. $V(10) = 310 \frac{\text{ft}}{\text{sec}}$, $a(10) = 61 \frac{\text{ft}}{\text{sec}^2}$. 3. -2. 4. $N(96) = 1000$, $N'(96) = -125 \frac{\text{people}}{\text{additional year}}$.

5. a) $AC(x) = \frac{5x + 100}{x}$, b) $MAC(x) = -\frac{100}{x^2}$; c) $MAC(20) = -0.25 \frac{\text{dollars}}{\text{additional unit}}$.

V. Optimization

1. 3600ft². 2. 40 motorbikes; price \$400; profit \$6,500. 3. 10in×10in×5in.
4. a) $x = 4$ (thousands); price is \$73.58. b) $x = e^4 \approx 54.6$ (thousands); price is \$1.00.

VI. Integrals

1. a) $3x^4 + 3x^2 - 3x + C$; b) $6x^{\frac{5}{3}} - 8x^{\frac{1}{2}} + C$; c) $3x^3 + \ln|x| - e^{-x} + C$; d) $0.5x^2 - 8x + 16\ln|x| + c$;

e) $\frac{1}{4}(x^5 - 4)^4 + C$; f) $\frac{1}{6}(x^4 - 1)^{\frac{3}{2}} + C$; g) $-\frac{1}{2}\ln|1 - 2x| + C$; h) $-\frac{1}{2}(t^2 - 4t + 1)^{-1} + C$;

i) $\frac{1}{4}e^{2x^2} + C$; j) $\frac{3}{2}\ln|e^{2x} - 1| + C$; k) $\frac{1}{8}(\ln x)^4 + C$.

2. a) 48; b) $\ln 5$; c) $2(e^2 - 1)$; d) 2.

VII. Applications

1. a) 13un^2 ; b) $2e^2 - 2\text{un}^2$; c) $2\ln 100\text{un}^2$. 2. a) $\frac{1}{6}\text{un}^2$. b) 108un^2 . 3. $\approx \$45.5$.

4. $N(t) = 50e^{0.4t} - 10$, 7.5 days. 5. 3216.