

Exam

Name \_\_\_\_\_

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

1) Find an equation of the tangent line to the curve  $y = \ln(x + 3)$  when  $x = -2$ . 1) \_\_\_\_\_

2) Find  $y'$  if  $y = \ln(2x^2 - 3)$ . 2) \_\_\_\_\_

3) Find  $y'$  if  $y = \log_2(4x + 5)$ . 3) \_\_\_\_\_

4) Find  $y'$  if  $y = \ln(x^2) + \ln^3 x$ . 4) \_\_\_\_\_

5) Find  $y'$  if  $y = \ln \sqrt{\frac{x-1}{x+1}}$ . 5) \_\_\_\_\_

6) Find  $y'$  if  $y = \ln[(x^2 + 5)^5(3 - 4x)^4]$ . 6) \_\_\_\_\_

7) Find  $y'$  if  $y = x^3 \ln(4x + 5)$ . 7) \_\_\_\_\_

8) Find  $y'$  if  $y = \ln[\ln(2x + 3)]$ . 8) \_\_\_\_\_

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

9) If  $y = \ln \sqrt{2x + 7}$ , then  $y' =$  9) \_\_\_\_\_

A)  $\frac{2}{\sqrt{2x + 7}}$ .

B)  $\sqrt{(2x + 7)^3}$ .

C)  $\frac{1}{\sqrt{2x + 7}}$ .

D)  $\frac{1}{\sqrt{(2x + 7)^3}}$ .

E)  $\frac{1}{2x + 7}$ .

10) If  $y = \ln\left(\frac{x^2 - 4x - 5}{x + 2}\right)$ , then  $\frac{dy}{dx} =$  10) \_\_\_\_\_

A)  $\left(\frac{x^2 - 4x - 5}{x + 2}\right)\left[\frac{x + 2}{x^2 - 4x - 5}\right]$ .

B)  $\frac{2(x - 2)}{x^2 - 4x - 5} - \frac{1}{x + 2}$ .

C)  $\frac{x + 2}{x^2 - 4x - 5}$ .

D)  $e^{\left[\ln(x^2 - 4x - 5) - \ln(x + 2)\right]}$ .

E)  $\frac{x^2 - 4x - 5}{x + 2}\left[\frac{2(x - 2)}{x^2 - 4x - 5} - \frac{1}{x + 2}\right]$ .

11) If  $y = (\ln 2)^2$ , then  $\frac{dy}{dx} =$  11) \_\_\_\_\_

A)  $2e^{\ln 2}$ .      B)  $e^{\ln 2}$ .      C)  $2 \ln 2$ .      D)  $0$ .      E)  $\frac{1}{(\ln 2)^2}$ .

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

12) Find  $\frac{dy}{dx}$  where  $y = \log_2(x^2 + 3x + 1)$ . 12) \_\_\_\_\_

13) If  $y = \frac{\ln x}{\ln x^2}$ , then find  $y'$ . 13) \_\_\_\_\_

14) If  $y = \frac{x^2 + 1}{x + \ln x}$ , then find  $y'$ . 14) \_\_\_\_\_

15) 15) \_\_\_\_\_  
 If  $y = \ln\left(\frac{\sqrt{x^3 + 3x - 1}}{\sqrt{x^2 + 2x - 1}}\right)$ , then find  $\frac{dy}{dx}$ .

16) At a soccer game concession stand, the profit  $P$  from selling  $x$  number of T-shirts (in hundreds) is given by  $P = 7x - 3x \ln x$ . Find  $\frac{dP}{dx}$ . 16) \_\_\_\_\_

17) The total revenue from the sales of a certain product are given by  $R(x) = \frac{3000x}{\ln(5x + 20)}$ . Find 17) \_\_\_\_\_  
 the marginal revenue.

18) The total revenue from the sales of a certain product are given by  $R(x) = \frac{2000x}{\ln(3x + 10)}$ . Find 18) \_\_\_\_\_  
 the marginal revenue.

- 19) The total revenue from the sales of a certain product are given by  $R(x) = \frac{400x}{\ln(2x+7)}$ . Find the marginal revenue. 19) \_\_\_\_\_
- 20) The total revenue from the sales of a certain product are given by  $R(x) = \frac{2255x}{\ln(7x+50)}$ . Find the marginal revenue. 20) \_\_\_\_\_
- 21) Find  $y'$  if  $y = -3e^{4x^2} - 5x + 3$ . 21) \_\_\_\_\_
- 22) Find  $y'$  if  $y = 4^2x + 1$ . 22) \_\_\_\_\_
- 23) Find  $y'$  if  $y = 10x^2 + 1$ . 23) \_\_\_\_\_
- 24) Find  $y'$  if  $y = e \ln x^2$ . 24) \_\_\_\_\_
- 25) Find  $y'$  if  $y = x^2e^{3x}$ . 25) \_\_\_\_\_
- 26) Find  $y'$  if  $y = \frac{xe^x}{x+1}$ . 26) \_\_\_\_\_
- 27) Suppose the demand equation for the manufacturer's product is  $p = 100e^{-0.04q}$ , where  $p$  is the price per unit for  $q$  units. Find the marginal revenue function. 27) \_\_\_\_\_

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 28) If  $f(x) = \frac{x^2 + 1}{e^{3x}}$ , then  $f'(x) =$  28) \_\_\_\_\_
- A)  $\frac{2x - x^2 - 1}{e^{6x}}$ .
- B)  $\frac{2x - 3x^2 - 3}{e^{3x}}$ .
- C)  $\frac{2x - 3x^2 - 3}{e^{6x}}$ .
- D)  $\frac{2x}{e^{3x+2}}$ .
- E)  $\frac{2x - x^2 - 1}{e^{3x}}$ .

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 29) If  $y = \alpha\sqrt{2}$ , then find  $y'$ . 29) \_\_\_\_\_

30) If  $y = x^3 + 3^x$ , then find  $y'$ . 30) \_\_\_\_\_

31) Suppose a population is growing according to the equation  $P = 100e^t$ . Find the rate of growth of the population,  $\frac{dP}{dt}$ . 31) \_\_\_\_\_

32) Differentiate:  $g(x) = e^{\sqrt{2x-5}}$  32) \_\_\_\_\_

33) Differentiate:  $g(x) = 4xe^{5x-7}$  33) \_\_\_\_\_

# Answer Key

Testname: UNTITLED5

1)  $y = x + 2$

2)  $\frac{4x}{(2x^2 - 3)}$

3)  $\frac{4}{(\ln 2)(4x + 5)}$  or  $\frac{4 \log_2 e}{4x + 5}$

4)  $\frac{2}{x} + \frac{3 \ln^2 x}{x}$

5)  $\frac{1}{2} \left[ \frac{1}{x-1} - \frac{1}{x+1} \right]$

6)  $\frac{10x}{x^2 + 5} - \frac{16}{3 - 4x}$

7)  $\frac{4x^3}{4x+5} + 3x^2 \ln(4x+5)$

8)  $\frac{2}{(2x+3)[\ln(2x+3)]}$

9) E

10) B

11) D

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

13) 0

14)  $\frac{2x(x + \ln x) - (x^2 + 1) \left( 1 + \frac{1}{x} \right)}{(x + \ln x)^2}$

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

16)  $\frac{dP}{dx} = 4 - 3 \ln x$

17)  $\frac{dR}{dx} = \frac{3000 \ln(5x + 20) - 3000x \left( \frac{1}{5x + 20} \right) \times 5}{[\ln(5x + 20)]^2}$

18)  $\frac{dR}{dx} = \frac{2000 \ln(3x + 10) - 2000x \left( \frac{1}{3x + 10} \right) \times 3}{[\ln(3x + 10)]^2}$

19)  $\frac{dR}{dx} = \frac{400 \ln(2x + 7) - 400x \left( \frac{1}{2x + 7} \right) \times 2}{[\ln(2x + 7)]^2}$

20)  $\frac{dR}{dx} = \frac{2255 \ln(7x + 50) - 2255x \left( \frac{1}{7x + 50} \right) \times 7}{[\ln(7x + 50)]^2}$

21)  $-3(8x - 5)e^{(4x^2 - 5x + 3)}$

22)  $2(\ln 4)4^{2x+1}$

## Answer Key

Testname: UNTITLED5

23)  $2x(\ln 10)(10^{x^2 + 1})$

24)  $2x$

25)  $x(3x + 2)e^{3x}$

26)  $\frac{e^x(x^2 + x + 1)}{(x + 1)^2}$

27)  $100e^{-0.04q}(-0.04q)$

28) B

29) 0

30)  $3x^2 + 3^x \ln 3$

31)  $\frac{dP}{dt} = 100e^t$

32)  $g'(x) = \frac{e^{\sqrt{2x-5}}}{\sqrt{2x-5}}$

33)  $g'(x) = 20xe^{5x-7} + 4e^{5x-7}$