

Exam

Name _____

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

Provide an appropriate response.

1) By the definition of a derivative, the derivative of $f(x) = \sqrt{x}$ is

1) _____

A) $\lim_{h \rightarrow 0} \frac{\sqrt{x+h}}{h}$.

B) $\lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h}$.

C) $\lim_{h \rightarrow 0} \frac{[\sqrt{x} + \sqrt{h}] - \sqrt{x}}{h}$.

D) $\lim_{h \rightarrow 0} \frac{\sqrt{x+h}}{h}$.

E) $\lim_{h \rightarrow 0} \frac{[\sqrt{x+h} - \sqrt{x}]}{h}$.

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

2) By using the definition of a derivative, find $f'(x)$ where $f(x) = \frac{2}{3x+5}$.

2) _____

3) Find the slope of the tangent line to the curve $y = \sqrt{x+2}$ at the point $(0, \sqrt{2})$.

3) _____

4) Find y' if $y = 4x^3 - 6x^2 + 7x - 8$.

4) _____

5) Find y' if $y = \frac{7}{3}(9x+3)$.

5) _____

6) Find y' if $y = \frac{1}{4} - \frac{x}{2}$.

6) _____

7) Find y' if $y = \frac{3}{4}x^{4/3} - \frac{1}{5}x^{1/4} + x^{-5/6}$.

7) _____

8) Find y' if $y = x^{-2} - \sqrt{x} + x^{-4/7}$.

8) _____

9) Find y' if $y = \frac{1}{2} - \frac{1}{2x}$.

9) _____

10) Find y' if $y = \sqrt{x}(x+2)$.

10) _____

11) Find y' if $y = \frac{x^2 + 2x + 3}{\sqrt{x}}$. 11) _____

12) Let $f(x) = 4x^2 - 3x + 1$. 12) _____
(a) Find $f'(x)$.
(b) Evaluate $f'(1)$.
(c) Find an equation of the tangent line to the graph of $y = f(x)$ at the point $(1, 2)$.

13) Let $f(x) = 2x^2 - 6x + 7$. 13) _____
(a) Find $f'(x)$.
(b) Evaluate $f'(2)$.
(c) Find an equation of the tangent line to the graph of $y = f(x)$ at the point $(2, 3)$.

14) Find all values of x for which the curve $y = x^3 + x^2$ has slope 1. 14) _____

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

15) An equation of the tangent line to the curve $y = 4x^2 - 6x - 5$ at the point $(-1, 5)$ is 15) _____
A) $y = (8x - 6)(x - 1) + 5$.
B) $y = -14x - 9$.
C) $y = 14x + 71$.
D) $y = -14x + 19$.
E) $y = 8x - 6$.

16) If $y = 2^2 + x$, then $\frac{dy}{dx} =$ 16) _____
A) 1. B) 5. C) 9.7. D) 2^2 . E) 0.

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

17) Find y' if $y = \sqrt[5]{x} \left(\sqrt[3]{\sqrt{x^2}} \right)$ 17) _____

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

18) A value of x for which the slope of the curve $y = \frac{x^3}{3} - \frac{3x^2}{2} + 2x + 1$ is zero is 18) _____
A) 3. B) -1. C) 2. D) 0. E) -2.

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

19) Find the rate of change of $y = x(x^2 + 9x + 3)$ with respect to x . 19) _____

20) Suppose that the equation $r = 430q - 2q^2$ gives the total revenue r (in dollars) that a manufacturer receives when q units of a product are sold. Determine the marginal revenue when $q = 100$ and interpret your result. 20) _____

21) Find the rate of change of y with respect to x when $y = 7 - 3x + 11x^3$. 21) _____

22) Find y' if $y = (x^3 - 10x + 2)(x^2 + 7x + 1)$. 22) _____

23) Find y' if $y = \frac{2x + 3}{7 - 5x}$. 23) _____

24) Find y' if $y = \frac{x^2 + 1}{2x^3 - 1}$. 24) _____

25) Find the slope of the curve $y = \frac{4x}{x + 2}$ at the point where $x = 3$. 25) _____

26) Find the slope of the curve $y = \frac{2x + 5}{x - 3}$ at the point $(4, 13)$. 26) _____

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

27) If $f(x) = \frac{x^2 + 4}{x^2 - 2}$, then $f'(x) =$ 27) _____

A) $\frac{12x}{(x^2 + 2)^2}$

B) 1

C) $\frac{6}{(x^2 - 2)^2}$

D) $\frac{4x + 26x - 9x^2}{(3x + 2)^2}$

E) $-\frac{12x}{(x^2 - 2)^2}$

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

28) 28) _____

Find the derivative of $y = \frac{\frac{1}{x} - \frac{7x}{x^2 + 1}}{\frac{2}{x} - \frac{3x}{x^2 + 1}}$.

29) Differentiate: $f(x) = (3x^2 + x)(8x - 7)$ 29) _____

30) Differentiate: $h(x) = (4x - 5)\sqrt{x}$ 30) _____

31) Differentiate: $g(x) = (x - 8)(2x - 7)(x + 5)$ 31) _____

32) Differentiate: $g(x) = \frac{3\sqrt{x}}{x + 4}$ 32) _____

33) Differentiate: $f(x) = \frac{3x^2 + 6}{5x^2 - 2x}$

33) _____

Answer Key

Testname: UNTITLED3

- 1) B
- 2) $-\frac{6}{(3x+5)^2}$
- 3) $\frac{1}{2\sqrt{2}}$
- 4) $12x^2 - 12x + 7$
- 5) 21
- 6) $-\frac{1}{2}$
- 7) $x^{1/3} - \frac{1}{20}x^{-3/4} - \frac{5}{6}x^{-11/6}$
- 8) $-2x^{-3} - \frac{1}{2\sqrt{x}} - \frac{4}{7}x^{-11/7}$
- 9) $\frac{1}{2x^2}$
- 10) $\frac{3}{2}x^{1/2} + \frac{1}{x^{1/2}}$
- 11) $\frac{3}{2}x^{1/2} + x^{-1/2} - \frac{3}{2}x^{-3/2}$
- 12) (a) $8x - 3$ (b) 5 (c) $y = 5x - 3$
- 13) (a) $4x - 6$ (b) 2 (c) $y = 2x - 1$
- 14) $-1, \frac{1}{3}$
- 15) B
- 16) A
- 17) $\frac{13}{15}x^{-2/15}$
- 18) C
- 19) $3x^2 + 18x + 3$
- 20) 30; if the number of units sold increases from 100 to 101, then the total revenue increases by approximately \$30.
- 21) $33x^2 - 3$
- 22) $(x^3 - 10x + 2)(2x + 7) + (x^2 + 7x + 1)(3x^2 - 10) = 5x^4 + 28x^3 - 27x^2 - 136x + 14$
- 23) $\frac{29}{(7-5x)^2}$
- 24) $\frac{-2x(x^3 + 3x + 1)}{(2x^3 - 1)^2}$
- 25) $\frac{8}{25}$
- 26) -11
- 27) E
- 28) $\frac{-22x}{(2-x^2)^2}$
- 29) $f'(x) = 8(3x^2 + x) + (8x - 7)(6x + 1)$ or
 $f'(x) = 72x^2 - 26x - 7$

Answer Key

Testname: UNTITLED3

$$30) h'(x) = \frac{4x - 5}{2\sqrt{x}} + 4\sqrt{x} \text{ or}$$

$$h'(x) = \frac{12x - 5}{2\sqrt{x}}$$

$$31) g'(x) = (2x - 7)(x + 5) + 2(x - 8)(x + 5) + (x - 8)(2x - 7) \text{ or}$$

$$g'(x) = 8x^3 - 252x^2 + 104x + 28$$

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

$$32) g'(x) = \frac{\frac{3(x + 4)}{2\sqrt{x}} - 3\sqrt{x}}{(x + 4)^2} \text{ or}$$

$$g'(x) = \frac{-3x + 12}{2\sqrt{x}(x + 4)^2}$$

$$33) f'(x) = \frac{6x(5x^2 - 2x) - (3x^2 + 6)(10x - 2)}{(5x^2 - 2x)^2} \text{ or}$$

$$f'(x) = \frac{20x^3 - 6x^2 - 60x + 12}{(5x^2 - 2x)^2}$$