

Math 1106 -- Instructor: Bruce Thomas
Fall Semester 2009
Practice Test #2

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

Differentiate.

$$1) y = \left(\frac{3}{x} + x \right) \left(\frac{3}{x} - x \right)$$

1) _____

A) $\frac{dy}{dx} = -\frac{9}{x^3} - 2x$

B) $\frac{dy}{dx} = -\frac{18}{x^3} - 2x$

C) $\frac{dy}{dx} = -\frac{18}{x} + 2x$

D) $\frac{dy}{dx} = \frac{18}{x^3} + 2x$

$$2) f(x) = (9x^5 + 6x^3 + 5)(5x^2 - 5\sqrt{x})$$

2) _____

A) $f'(x) = (5x^2 - 5\sqrt{x})(45x^4 + 18x^2 + 5) + \left(10x - \frac{5\sqrt{x}}{2} \right) (9x^5 + 6x^3 + 5)$

B) $f'(x) = (5x^2 - 5\sqrt{x})(45x^4 + 18x^2) + \left(10x - \frac{5}{2\sqrt{x}} \right) (9x^5 + 6x^3 + 5)$

C) $f'(x) = (45x^4 + 18x^2) \left(10x - \frac{5}{2\sqrt{x}} \right)$

D) $f'(x) = (5x^2 - 5\sqrt{x})(9x^4 + 6x^2) + \left(5x - \frac{5}{2\sqrt{x}} \right) (9x^5 + 6x^3 + 5)$

$$3) y = \frac{7x - 6}{4x^2 + 5}$$

3) _____

$$A) \frac{dy}{dx} = \frac{-28x^2 + 13x + 65}{(4x^2 + 5)^2}$$

$$B) \frac{dy}{dx} = \frac{28x^3 - 56x^2 + 83x}{(4x^2 + 5)^2}$$

$$C) \frac{dy}{dx} = \frac{-28x^2 + 48x + 35}{(4x^2 + 5)^2}$$

$$D) \frac{dy}{dx} = \frac{84x^2 - 48x + 35}{(4x^2 + 5)^2}$$

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

4) _____

$$A) \frac{dy}{dx} = \frac{-4x^4 - 3x^3 + 15x^2 - 12x}{(x^3 - 6x^2)^2}$$

$$B) \frac{dy}{dx} = \frac{20x^4 - 96x^3 + 9x^2 - 12x}{(x^3 - 6x^2)^2}$$

$$C) \frac{dy}{dx} = \frac{-4x^4 - 2x^3 + 9x^2 - 12x}{(x^3 - 6x^2)^2}$$

$$D) \frac{dy}{dx} = \frac{20x^4 - 2x^3 + 9x^2 - 12x}{x^3 - 6x^2}$$

$$5) q(t) = \frac{t^2 - 3t + 6}{t^2 + 4t + 7}$$

5) _____

$$A) q'(t) = \frac{7t^2 + 2t - 45}{t^2 + 4t + 7}$$

$$B) q'(t) = \frac{7t^2 + 14t - 45}{(t^2 + 4t + 7)^2}$$

$$C) q'(t) = \frac{7t^2 + 2t - 45}{(t^2 + 4t + 7)^2}$$

$$D) q'(t) = \frac{7t^2 + 2t - 21}{(t^2 + 4t + 7)^2}$$

Write an equation of the tangent line to the graph of $y = f(x)$ at the point on the graph where x has the indicated value.

6) $f(x) = (3x^2 + 5x + 4)(4x + 3)$, $x = 0$

6) _____

A) $y = 31x + 12$

B) $y = \frac{1}{31}x + 12$

C) $y = 31x - 12$

D) $y = \frac{1}{31}x - 12$

7) $f(x) = \frac{7x^2 + 6}{-3x + 2}$, $x = 0$

7) _____

A) $y = \frac{9}{2}x + 3$

B) $y = -\frac{9}{2}x + 3$

C) $y = -\frac{9}{2}x - 3$

D) $y = \frac{9}{2}x - 3$

Solve the problem.

8) The population P , in thousands, of a small city is given by:

8) _____

$$P(t) = \frac{800t}{2t^2 + 5}$$

where t = the time, in months. Find the growth rate.

A) $P'(t) = \frac{800(5 - 2t^2)}{(2t^2 + 5)^2}$

B) $P'(t) = \frac{800(2t^2 - 5)}{(2t^2 + 5)^2}$

C) $P'(t) = \frac{800(5 - 2t^2)}{2t^2 + 5}$

D) $P'(t) = \frac{800(5 + 6t^2)}{(2t^2 + 5)^2}$

Differentiate.

9) $f(x) = (9x + 8)^5$

9) _____

A) $f'(x) = 5(9x + 8)^4$

B) $f'(x) = 45(9x + 8)^4$

C) $f'(x) = 45(9x + 8)^5$

D) $f'(x) = 9(9x + 8)^4$

10) $f(x) = \sqrt{1 - 8x}$

10) _____

A) $f'(x) = \frac{1}{2\sqrt{1 - 8x}}$

B) $f'(x) = -\frac{4}{\sqrt{1 - 8x}}$

C) $f'(x) = -\frac{4x}{\sqrt{1 - 8x}}$

D) $f'(x) = -\frac{8}{\sqrt{1 - 8x}}$

11) $f(x) = (2x^5 - 3x^4 + 8)^{302}$

11) _____

A) $f'(x) = 302(2x^5 - 3x^4 + 8)^{301}(10x^4 - 12x^3)$

B) $f'(x) = 302(10x^4 - 12x^3)^{301}$

C) $f'(x) = 302(2x^5 - 3x^4 + 8)^{301}$

D) $f'(x) = 302(2x^5 - 3x^4 + 8)^{301}(5x^4 - 4x^3)$

12) $y = (2x - 1)^3(x + 7)^{-3}$

12) _____

A) $\frac{dy}{dx} = 45(2x - 1)^3(x + 7)^{-2}$

B) $\frac{dy}{dx} = 45(2x - 1)^2(x + 7)^{-4}$

C) $\frac{dy}{dx} = 45(2x - 1)^3(x + 7)^{-4}$

D) $\frac{dy}{dx} = 45(2x - 1)^2(x + 7)^{-3}$

Find an expression for dy/dx .

13) $y = u^2$ and $u = 4x - 1$

A) $16x - 4$

B) $32x$

C) $8x - 4$

D) $32x - 8$

13) _____

For questions 14 and 15, find $\frac{d^2y}{dx^2}$.

14) $y = (4x + 5)^3$

A) $384x + 480$

B) $4x + 5$

C) $24x + 30$

D) $12x + 15$

14) _____

15) $y = (x^2 + 3x)^{40}$

A) $40(x^2 + 3x)^{38}(158x^2 + 474x + 351)$

B) $1560(x^2 + 3x)^{38}$

C) $40(x^2 + 3x)^{39}(2x + 3)$

D) $40(x^2 + 3x)^{38}(2x^2 + 84x + 117)$

15) _____

Solve the problem.

16) If s is a distance given by $s(t) = 4t^4 + 7t^2 + 2t$, find the acceleration.

A) $48t^2 + 14$

B) $16t^2 + 14t + 2$

C) $48t + 14$

D) $16t^3 + 14t + 2$

16) _____

Find the relative extrema of the function, if they exist.

17) $f(x) = x^3 - 3x^2 + 1$

17) _____

- A) Relative maximum at (2, -3)
- B) Relative maximum at (-2, -19); relative maximum at (0, 1)
- C) Relative maximum at (0, 1); relative minimum at (2, -3)
- D) Relative minimum at (0, 1); relative maximum at (2, -3)

18) $f(x) = x^4 - 18x^2 + 1$

18) _____

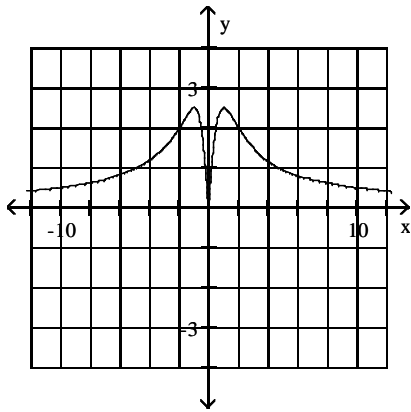
- A) Relative maximum at (3, -80); relative minimum at (-3, -80)
- B) Relative maximum at (0, 1); relative minima at (3, -80), (-3, -80)
- C) Relative maximum at (0, 1); relative minimum at (3, -80)
- D) Relative minimum at (0, 1); relative maxima at (3, -80), (-3, -82)

Graph the function by first finding the relative extrema.

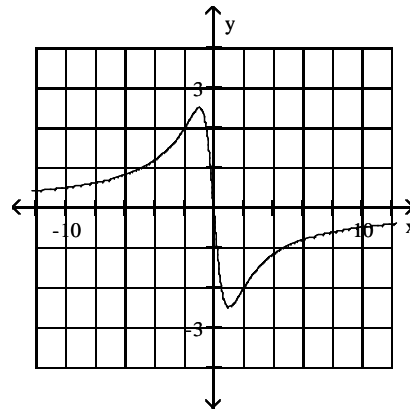
19) $f(x) = \frac{5x}{x^2 + 1}$

19) _____

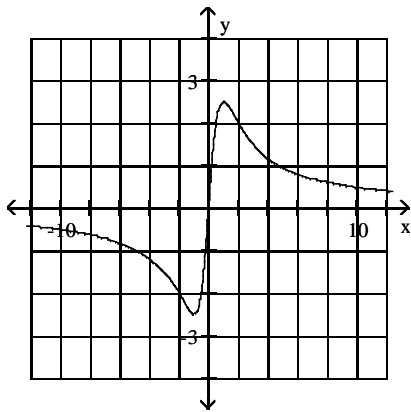
A)



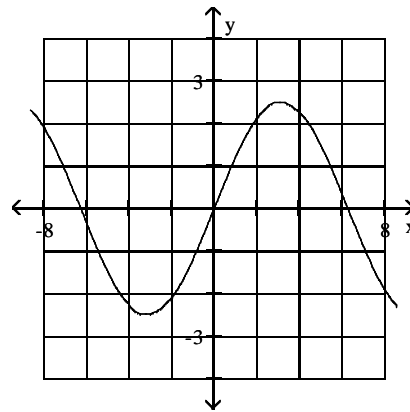
B)



C)



D)



Find the points of inflection.

20) $f(x) = 4x^3 + 2x + 8$

20) _____

A) (0, 2)

B) (8, 0)

C) (0, 8)

D) (2, 0)

Determine where the given function is concave up and where it is concave down.

21) $f(x) = 2x^3 - 3x^2 - 12x$

21) _____

A) Concave up on $(-\infty, -1)$, concave down on $(-1, \infty)$

B) Concave up on $\left[-\infty, \frac{1}{2}\right)$, concave down on $\left(\frac{1}{2}, \infty\right)$

C) Concave down on $(-\infty, -1)$, concave up on $(-1, \infty)$

D) Concave down on $\left[-\infty, \frac{1}{2}\right)$, concave up on $\left(\frac{1}{2}, \infty\right)$

Find the absolute maximum and absolute minimum values of the function, if they exist, on the indicated interval.

22) $f(x) = x^4 - 32x^2 + 6$; $[-5, 5]$

22) _____

A) Absolute maximum: 0, absolute minimum: -250

B) Absolute maximum: 6, absolute minimum: -250

C) Absolute maximum: -250

D) Absolute minimum: 0

Solve the problem.

- 23) Find the number of units that must be produced and sold in order to yield the maximum profit, given the following equations for revenue and cost: 23) _____

$$R(x) = 7x$$

$$C(x) = 0.001x^2 + 0.8x + 80.$$

- A) 3100 units B) 3900 units C) 6200 units D) 7800 units

- 24) An appliance company determines that in order to sell x dishwashers, the price per dishwasher must be $p = 600 - 0.3x$. It also determines that the total cost of producing x dishwashers is given by $C(x) = 6000 + 0.9x^2$. How many dishwashers must the company produce and sell in order to maximize profit? 24) _____

- A) 220 B) 500 C) 210 D) 250

- 25) A hotel has 220 units. All rooms are occupied when the hotel charges \$70 per day for a room. For every increase of x dollars in the daily room rate, there are x rooms vacant. Each occupied room costs \$26 per day to service and maintain. What should the hotel charge per day in order to maximize daily profit? 25) _____

- A) \$145 B) \$88 C) \$158 D) \$143

Answer Key

Testname: 1106 PRACTICE TEST 2 FALL 2009

- 1) B
- 2) B
- 3) C
- 4) C
- 5) C
- 6) A
- 7) A
- 8) A
- 9) B
- 10) B
- 11) A
- 12) B
- 13) D
- 14) A
- 15) A
- 16) A
- 17) C
- 18) B
- 19) C
- 20) C
- 21) D
- 22) B
- 23) A
- 24) D
- 25) C