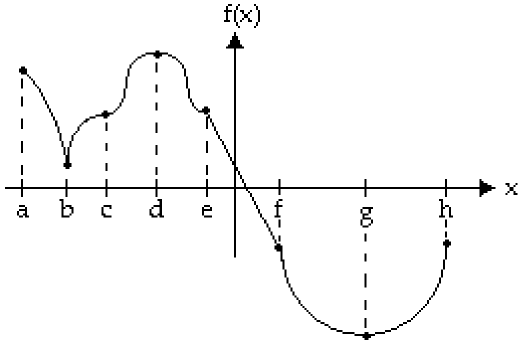
MAC 2233 Business Calculus
Practice 5

Broward College

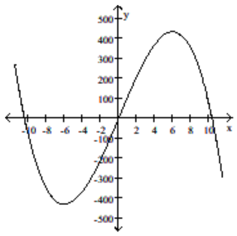
Provide an appropriate response.

1) Identify the intervals where $f'(x) > 0$. 1) ______________



Use the given graph of f(x) to find the intervals on which $f'(x) > 0$.

2) 2) ________



A) $f'(x) > 0$ on $(-\infty, 6]$, $f'(x) < 0$ on $[6, \infty)$

B) $f'(x) > 0$ on $[-36, 36]$, $f'(x) < 0$ on $(-\infty, -36] \cup [36, \infty)$

C) $f'(x) > 0$ on $[-6, 6]$, $f'(x) < 0$ on $(-\infty, -6] \cup [6, \infty)$

D) $f'(x) > 0$ on $(-\infty, -6] \cup [6, \infty)$, $f'(x) < 0$ on $[-6, 6]$

Provide an appropriate response.

3) Determine the intervals for which the function $f(x) = x^3 + 18x^2 + 2$, is decreasing. 3) ________

A) $(-\infty, -12)$ and $(0, \infty)$
B) $(-\infty, -12)$ and $(-12, 0)$
C) $(-12, 0)$
D) $(0, 12)$ and $(12, \infty)$

4) Determine the interval(s) where $f(x) = \dfrac{x^2}{x - 3}$ is decreasing. 4) ________

A) (0, 3) and $(6, \infty)$
B) $(-\infty, 0)$ and $(6, \infty)$
C) (0, 3) and (3, 6)
D) (0, 6)

5) Given $f(x) = x + \frac{16}{x}$, $x < 0$, find the values of x corresponding to local maxima and local minima. 5) ________

A) no local maximum or minimum
B) local maximum at $x = -4$, local minimum at $x = 4$
C) local maximum at $x = -4$ (no local minimum)
D) local minimum at $x = -4$ (no local maximum)

6) The critical values of $f(x) = 4x^3 - 48x + 24$ are $x = -2$ and $x = 2$. Use the first derivative test to determine which of the critical values correspond to a local minimum. 6) ________

A) $x = -2$
B) $x = 2$ and $x = -2$
C) $x = 2$
D) neither $x = 2$ nor $x = -2$ correspond to a local minimum

7) Find the critical values and determine the intervals where f(x) is increasing and the intervals where f(x) is decreasing for the function $f(x) = x^3 + 3x^2 - 24x + 6$. 7) ________

A) increasing on $(-\infty, -4)$; decreasing on $(-4, 2)$
B) increasing on $(-\infty, -4)$ and $(2, \infty)$; decreasing on $(-4, 2)$
C) increasing on $(-\infty, -4)$ and $(2, \infty)$; decreasing on $(-4, \infty)$
D) decreasing on $(-\infty, -4)$ and $(2, \infty)$; increasing on $(-4, 2)$

Solve the problem.

8) The annual revenue and cost functions for a manufacturer of grandfather clocks are approximately $R(x) = 480x - 0.03x^2$ and $C(x) = 200x + 100{,}000$, where x denotes the number of clocks made. What is the maximum annual profit? 8) ________

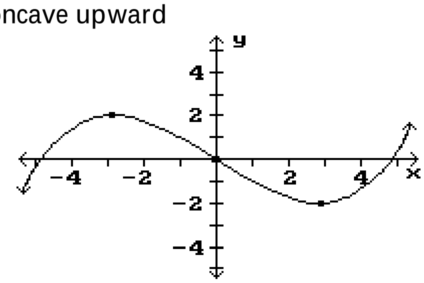
A) $853,333 B) $553,333 C) $653,333 D) $753,333

9) The cost of manufacturing x electric woks in one day is given by $C(x) = 2x^3 - 16x^2 + 4x$. Find the average cost per electric wok and the interval where the average cost per electric wok is decreasing. 9) ________

A) $\overline{C}(x) = 2x^2 - 32x + 4$; $0 < x < 4$
B) $\overline{C}(x) = 6x^2 - 32x + 4$; $x < 4$
C) $\overline{C}(x) = 6x^2 - 32x + 4$; $0 < x < 4$
D) $\overline{C}(x) = 2x^2 - 16x + 4$; $0 < x < 4$

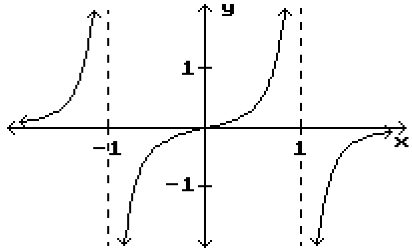
Find the intervals where the function has the indicated concavity. Give the x coordinates of inflection points.

10) Concave upward 10) ________



A) $(0, \infty)$; $x = 0$
B) $(0, \infty)$; no inflection points
C) $(-3, \infty)$; $x = 0$
D) $(-3, 3)$; $x = 0$

11) Concave downward 11) _______



A) (-1, 0); no inflection points
B) $(-\infty, -1)$; no inflection points
C) $(-1, 0)$, $(1, \infty)$; x = 0
D) $(-1, 0)$, $(1, \infty)$; x = 0 and x = 1

Provide an appropriate response.

12) Find f''(x) for $f(x) = -7x^9 + 5x^2$. 12) _______

A) $f''(x) = 504x^8 + 10$
B) $f''(x) = 504x^7 - 10$
C) $f''(x) = -63x^8 + 10x$
D) $f''(x) = -504x^7 + 10$

13) Find f''(x) for f(x) = 4x - 6. 13) _______

A) $f''(x) = 4x^3 - 6x^2$
B) $f''(x) = \frac{4}{x}$
C) f''(x) = 4
D) f''(x) = 0

14) Find y'' for $y = -\frac{1}{3x + 4}$. 14) _______

A) $y'' = -\frac{18}{(3x + 4)^3}$
B) $y'' = \frac{18}{(3x + 4)^3}$
C) $y'' = -\frac{6}{(3x + 4)^3}$
D) $y'' = -\frac{2}{(3x + 4)^3}$

15) Find y'' for $y = x^4 - 8x^{1/2}$ 15) _______

A) $12x^2 + \frac{2}{x\sqrt{x}}$
B) $4x^3 - \frac{4}{\sqrt{x}}$
C) $4x^3 + \frac{4}{\sqrt{x}}$
D) $12x^2 - \frac{4}{\sqrt{x}}$

16) Determine the interval(s) over which $f(x) = (x - 4)^3$ is concave downward. 16) _______

A) $(-4, \infty)$
B) $(-\infty, -4)$
C) $(4, \infty)$
D) $(-\infty, 4)$

17) Find all inflection points for $f(x) = x^4 - 10x^3 + 24x^2 + 3x + 5$. 17) _______

A) Inflection points at x = 0, x = 1, x = 4
B) Inflection points at $x \approx -0.06$, $x \approx 2.43$, $x \approx 5.13$
C) Inflection points at x = 1, x = 4
D) This function does not have any inflection points.

18) Find the inflection point(s) for $f(x) = \sqrt{x + 7}$. 18) _______

A) (-6, 1)
B) (-7, 0)
C) (-3, 2)
D) There are no points of inflection.

Decide if the given value of x is a critical number for f, and if so, decide whether the point for x on f is a local minimum, local maximum, or neither.

19) $f(x) = (x + 4)^4$; $x = -4$ 19) _______

A) Critical number but not an extreme point.
B) Critical number; minimum at (-4 , 0)
C) Not a critical number.
D) Critical number; maximum at (-4 , 0)

Provide an appropriate response.

20) Find the absolute minimum value of $f(x) = \frac{e^x}{x^3}$ for $x > 0$. Round your answer to three decimal places. 20) _______

A) 3 at x = 0.7439
B) 2.718 at x = 1
C) 0.7439 at x = 3
D) 1 at x = 2.718

21) Find the absolute maximum and minimum values of $f(x) = 9x^3 - 54x^2 + 81x + 13$ on the interval [-6, 2]. 21) _______

A) max f(x) = f(1) = 49
min f(x) = f(-6) = -4361
B) max f(x) = f(1) = 4361
min f(x) = f(-6) = -49
C) max f(x) = f(1) = 4361
min f(x) = f(-6) = 49
D) max f(x) = f(-6) = -4361
min f(x) = f(1) = 49

22) Find the absolute minimum value of $f(x) = 5 + 4x + \frac{16}{x}$ for $x > 0$. 22) _______

A) min f(x) = f(2) = 21
B) min f(x) = f(2) = 13
C) min f(x) = f(1) = 25
D) min f(x) = f(0) = 5

23) Find two numbers whose sum is 360 and whose product is a maximum. 23) _______

A) 1 and 359
B) 179 and 181
C) 180 and 180
D) 10 and 350

Solve the problem.

24) A carpenter is building a rectangular room with a fixed perimeter of 180 ft. What are the dimensions of the largest room that can be built? What is its area? 24) _______

A) 45 ft by 135 ft; 6,075 ft^2
B) 90 ft by 90 ft; 8,100 ft^2
C) 18 ft by 162ft; 2,916 ft^2
D) 45 ft by 45 ft; 2,025 ft^2

25) A company wishes to manufacture a box with a volume of 40 cubic feet that is open on top and is twice as long as it is wide. Find the width of the box that can be produced using the minimum amount of material. Round to the nearest tenth, if necessary. 25) _______

A) 3.6 ft
B) 6.4 ft
C) 3.2 ft
D) 7.2 ft

26) A company manufactures and sells x pocket calculators per week. If the weekly cost and demand equations are given by: 26) _______

$C(x) = 8{,}000 + 5x$

$p = 14 - \frac{x}{4{,}000}, \qquad 0 \le x \le 25{,}000$

Find the production level that maximizes profit.

A) 2000 pocket calculators per week
B) 18,000 pocket calculators per week
C) 8000 pocket calculators per week
D) 14,000 pocket calculators per week