Exam

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

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

1) $f(x) = x^3 - 12x - 4$ — 1) **D**

A) Relative maximum at (5, 61); relative minimum at (2, −20)
B) Relative maximum at (5, 61); relative minimum at (−3, 5)
C) Relative minimum at (−2, 12); relative maximum at (2, −20)
D) Relative maximum at (−2, 12); relative minimum at (2, −20)

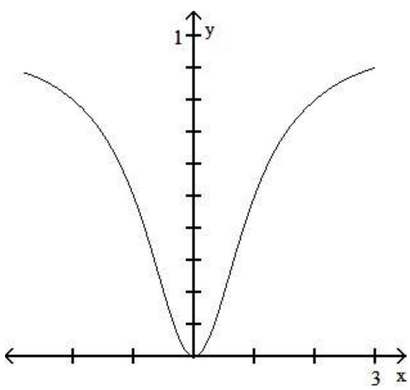
Find the absolute maximum and absolute minimum values of the function, if they exist, over the indicated interval. When no interval is specified, use the real line $(-\infty, \infty)$.

2) $f(x) = x^3 - 9x^2 + 4$; $(0, \infty)$ — 2) **C**

A) Absolute maximum: 4; no absolute minimum
B) No absolute maximum; absolute minimum = −104
C) Absolute maximum: 4; absolute minimum = −104
D) No absolute extrema

Find the absolute maximum and absolute minimum values of the function, if they exist, over the indicated interval, and indicate the x–values at which they occur.

3) $f(x) = \frac{x^2}{x^2 + 1}$; $[-3, 2]$ — 3) **A**



A) Absolute maximum = 0.9 at x = −3; absolute minimum = 0 at x = 0
B) Absolute maximum = 2 at x = −3; absolute minimum = −3 at x = 2
C) Absolute maximum = 0.8 at x = −3; absolute minimum = 0 at x = 0
D) Absolute maximum = 0.9 at x = 2; absolute minimum = −3 at x = 0

Solve the problem.

4) The percent of concentration of a certain drug in the bloodstream x hr after the drug is administered is given by $K(x) = \frac{5x}{x^2 + 9}$. How long after the drug has been administered is the concentration a maximum? Round answer to the nearest tenth, if necessary. — 4) **C**

A) 0.9 hr B) 0.5 hr C) 3 hr D) 5 hr

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

5) $f(x) = \frac{8x}{x^2 + 36}$ 5) **D**

A) Concave down on $(-\infty, -\sqrt{108})$ and $(\sqrt{108}, \infty)$, concave up on $(-\sqrt{108}, \sqrt{108})$.
B) Concave down on $(-\infty, 0)$, concave up on $(0, \infty)$
C) Concave up on $(-\infty, -\sqrt{108})$ and $(0, \sqrt{108})$, concave down on $(-\sqrt{108}, 0)$ and $(\sqrt{108}, \infty)$.
D) Concave down on $(-\infty, -\sqrt{108})$ and $(0, \sqrt{108})$, concave up on $(-\sqrt{108}, 0)$ and $(\sqrt{108}, \infty)$.

Provide an appropriate response.

6) Compare the behavior of the second derivative of a function around a point of inflection with its behavior around a maximum or minimum. 6) **C**

A) The second derivative maintains the same sign as x is followed from one side of a maximum or minimum to the other, but the second derivative changes sign as x is followed from one side of a point of inflection to the other.
B) The second derivative maintains the same sign as x is followed from one side of a maximum, minimum, or point of inflection to the other.
C) The second derivative changes sign as x is followed from one side of a maximum, minimum, or point of inflection to the other.
D) The second derivative changes sign as x is followed from one side of a maximum or minimum to the other, but the second derivative maintains the same sign as x is followed from one side of a point of inflection to the other.

Solve the problem.

7) An outdoor sports company sells 768 kayaks per year. It costs $12 to store one kayak for a year. Each reorder costs $8, plus an additional $7 for each kayak ordered. In what lot size should the store order kayaks in order to minimize inventory costs? 7) **A**

A) 32 B) 42 C) 37 D) 36

8) The diameter of a circle is given by the formula $D = \frac{C}{\pi}$, where C is the circumference. The diameter of a tree was 10 in. During the following year, the circumference increased by 2 in. Use $D'(C)$ to estimate how much the tree's diameter increased in that year. 8) **B**

A) $\frac{10}{\pi}$ in. B) $\frac{\pi}{2}$ in. C) $\frac{12}{\pi}$ in. D) $\frac{2}{\pi}$ in.

Find the relative extrema of the function and classify each as a maximum or minimum.

9) $f(x) = 3 - x^2$ 9) **A**

A) Relative maximum: (0, 3) B) Relative minima: $(-\sqrt{3}, 0)$, $(\sqrt{3}, 0)$
C) Relative maximum: $(3, \sqrt{3})$ D) Relative minimum: (0, 3)

Solve the problem.

10) The profit, in dollars, from the sale of x compact disc players is $P(x) = x^3 - 4x^2 + 10x + 9$. Find the marginal profit when x = 10 . 10) **B**

A) $699 B) $230 C) $690 D) $239

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

11) $f(x) = 9x - x^3$ 11) **C**

A) Concave up on $(-\infty, 0)$ and $(1, \infty)$, concave down on $(0, 1)$

B) Concave down for all t

C) Concave up on $(0, \infty)$, concave down on $(-\infty, 0)$

D) Concave up on $(-\infty, 0)$, concave down on $(0, \infty)$

Find dy for the given values of x and dx.

12) $y = 2x^5 - 3x^2 + x - 1;\ x = -1,\ dx = \frac{1}{3}$ 12) **D**

A) $\frac{22}{3}$ B) $\frac{19}{3}$ C) $\frac{25}{3}$ D) $\frac{17}{3}$

Find the limit, if it exists.

13) $\lim_{x \to \infty} \frac{5 - 3x^2}{12 - 5x}$ 13) **C**

A) $\frac{5}{12}$ B) $\frac{3}{5}$ C) $-\infty$ D) ∞

Solve the problem.

14) An appliance company determines that in order to sell x dishwashers, the price per dishwasher must be 14) ______

$p = 720 - 0.3x$.

It also determines that the total cost of producing x dishwashers is given by

$C(x) = 4000 + 0.7x^2$.

What price must be charged per dishwasher in order to maximize profit?

A) \$632 B) \$612 C) \$1224 D) \$652