4.3: Monotonic Functions and the First Derivative Test.

Using the derivative of f(x) given below, determine the critical points of f(x).

1) $f'(x) = (x + 10)(x + 4)$ 1) ________

A) 4, 10 B) -10, -4 C) 0, -10, -4 D) -14

Using the derivative of f(x) given below, determine the intervals on which f(x) is increasing or decreasing.

2) $f'(x) = x^{1/3}(x - 5)$ 2) ________

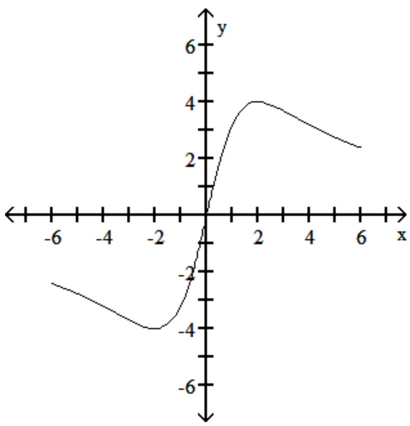
A) Decreasing on $(0, 5)$; increasing on $(-\infty, 0) \cup (5, \infty)$
B) Decreasing on $(-\infty, 0) \cup (5, \infty)$; increasing on $(0, 5)$
C) Decreasing on $(0, 5)$; increasing on $(5, \infty)$
D) Increasing on $(0, \infty)$

3) $f'(x) = (x + 2)^2 e^{-x}$ 3) ________

A) Decreasing on $(-\infty, -2)$; increasing on $(-2, \infty)$
B) Never decreasing; increasing on $(-\infty, -2) \cup (-2, \infty)$
C) Never increasing; decreasing on $(-\infty, -2) \cup (-2, \infty)$
D) Never decreasing; increasing on $(-\infty, 2) \cup (2, \infty)$

Find the open intervals on which the function is increasing and decreasing. Identify the function's local and absolute extreme values, if any, saying where they occur.

4) 4) ________



A) increasing on $(-2, 2)$; decreasing on $(0, 6)$;
absolute maximum at $(2, 4)$; absolute minimum at $(-2, -4)$
B) increasing on $(-2, 2)$; decreasing on $(-6, -2)$ and $(2, 6)$;
no absolute maximum; no absolute minimum
C) increasing on $(-2, 2)$; decreasing on $(-6, -2)$ and $(2, 6)$;
absolute maximum at $(2, 4)$; absolute minimum at $(-2, -4)$
D) increasing on $(-2, 2)$; decreasing on $(-6, 0)$;
absolute maximum at $(2, 4)$; absolute minimum at $(-2, -4)$

Find the largest open interval where the function is changing as requested.

5) Increasing $f(x) = \dfrac{1}{x^2 + 1}$ 5) ________

A) $(1, \infty)$ B) $(-\infty, 0)$ C) $(-\infty, 1)$ D) $(0, \infty)$

Identify the function's local and absolute extreme values, if any, saying where they occur.

6) $f(x) = -x^3 - 7.5x^2 - 12x + 2$ 6) ________

A) local maximum at x = -1; local minimum at x = -4
B) local maximum at x = 4; local minimum at x = 1
C) local maximum at x = 1; local minimum at x = 4
D) local maximum at x = -4; local minimum at x = -1

7) $f(r) = (r - 5)^3$ 7) ________

A) local minimum: x = 5
B) no local extrema
C) local minimum: x = 0
D) local minimum: x = 0; local maximum: x = 5

8) $h(x) = \dfrac{x - 1}{x^2 + 3x + 5}$ 8) ________

A) no local extrema
B) local minimum at x = -3; local maximum at x = 4
C) local minimum at x = -2; local maximum at x = 4
D) local minimum at x = -2; no local maxima

Identify the function's extreme values in the given domain, and say where they are assumed. Tell which of the extreme values, if any, are absolute.

9) $f(x) = \sqrt{4 - x^2}$, $-2 \le x < 2$ 9) ________

A) local and absolute minimum: 0 at x = -2;
local and absolute maximum: 2 at x = 0
B) no local extrema; no absolute extrema
C) local and absolute minimum: 0 at x = -2 and x = 2;
local and absolute maximum: 2 at x = 0
D) local and absolute maximum: 0 at x = -2;
local and absolute minimum: 2 at x = 0

Find the extrema of the function on the given interval, and say where they occur.

10) $y = \sin 4x$, $0 \le x \le \frac{\pi}{2}$ 10) ________

A) local maxima: 1 at $x = \frac{\pi}{8}$ and 0 at $x = \frac{\pi}{2}$;
local minimum: -1 at $x = \frac{3\pi}{8}$

B) local maxima: 1 at $x = \frac{\pi}{4}$ and 0 at $x = \frac{\pi}{2}$;
local minima: 0 at x = 0 and -1 at $x = \frac{3\pi}{8}$

C) local maxima: 1 at $x = \frac{\pi}{8}$ and 0 at $x = \frac{\pi}{2}$;
local minima: 0 at x = 0 and -1 at $x = \frac{3\pi}{8}$

D) local maxima: 1 at $x = \frac{\pi}{8}$ and 0 at $x = \frac{\pi}{4}$;
local minimum: 0 at x = 0

Answer Key
Testname: PRACTICE16

1) B
2) A
3) B
4) C
5) B
6) A
7) B
8) C
9) A
10) C