Weekly Quiz #8

Problem 1.

Which of the following functions is increasing $(0, \infty)$?

Answers *

○ $f(x) = 13 - x^3$

○ $f(x) = -4x + 1$

○ $f(x) = -4x^2$

✓ x^2

Problem 2.

Which of the following functions, when defined on the set of non-negative real numbers, is decreasing?

Answers *

○ $f(x) = 2x$

○ $f(x) = x^{1/2}$

○ $f(x) = x^3 + 4x^2 + x + 1$

✓ $f(x) = -2(x^2 + 9)$

Problem 3.

Let $f(x) = x^3 + 3x^2 - 45x + 4$. Then the local extrema of $f(x)$ are

Answers *

○ A local minimum of -179 at $x = 5$ and a local maximum of 77 at $x = -3$.

✓ A local minimum of -77 at $x = 3$ and a local maximum of 179 at $x = -5$.

○ A local minimum of -179 at $x = -5$ and a local maximum of -77 at $x = 3$.

○ A local minimum of -77 at $x = 3$ and a local maximum of 77 at $x = 5$.

Problem 4

For what values of x does the function $f(x) = x^3 - 9x^2 - 120x + 6$ have a local minimum?

Answers *

✓ 10

○ 4

○ 3

○ -4

Problem 5.

The graph of $y = x^3 - 5x^2 + 4x + 2$ has a local minimum at

Answers *

○ (0.46, 2.87)

○ (0.46, 0)

✓ (2.94, -4.05)

○ (4.06, 2.87)

Problem 6.

The graph of $y = x^3 - 2x^2 - 5x + 2$ has a local maximum at

Answers *

○ (2.12, 0)

○ (2.12, -8.061)

○ (-0.786, 0)

✓ (-0.786, 4.209)

Problem 7.

Find the relative extrema for the following functions by (1) determining the critical value(s) and (2) determining whether at these critical values the function is a relative maximum or minimum (or possible inflection point).

$$f(x) = -8x^2 + 12x + 3$$

Answers *

✓   x = 3 /4 , relative maximum

◯   x = 3/ 4 , relative minimum

◯   x = - 3 /4 , relative minimum

◯   x = - 3 /4 , relative maximum

Problem 8.

Find the relative extrema for the following functions by (1) determining the critical value(s) and (2) determining whether at these critical values the function is a relative maximum or minimum (or possible inflection point).

$$f(x) = (x - 1)^3$$

Answers *

✓   x = 1, inflection point

◯   x = 1, relative minimum

◯   x = 1, relative maximum

◯   x = 1 is not a critical value

Problem 9.

Optimize the following function by (1) finding the critical value(s) at which the function is optimized and (2) testing the second-order condition to distinguish between a relative maximum or minimum and (3) the values of the relative extrema for the function. For the following given function

$$f(x) = x^2 + 6x + 9$$

Which if the following is correct?

Answers *

○   x = −3, relative maximum, f(−3) = 0

○   x = 3, relative minimum, f(−3) = 0

✓   x = −3, relative minimum, f(−3) = 0

○   x = −3, relative minimum, f(−3) = −1

Problem 10.

Optimize the following function by (1) finding the critical value(s) at which the function is optimized and (2) testing the second-order condition to distinguish between a relative maximum or minimum and (3) the value(s) of the relative extrema for the function. For the following giving function

$$f(x) = x^3 + 6x^2 - 96x + 23$$

Which of the following choices is correct?

Answers *

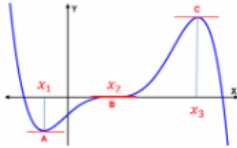✓   x = 4, relative minimum; x = −8, relative maximum; f(4) = −201 and f(−8) = 663

○   x = −4, relative minimum; x = 8, relative maximum; f(−4) = 200 and f(8) = −665

○   x = 4, relative minimum; x = 8, relative maximum; f(4) = −201 and f(8) = 663

○   x = 4, relative minimum; x = −8, relative maximum; f(4) = −154 and f(−8) = 653

Problem 11

Which of the following statements is true based on the given figure.

Answers *

✓ A, B, and C are critical points.

○ C and A are inflection points.

○ A, B, and C are relative extrema.

○ Only A and C are critical points

Problem 12.

Find the critical points in the following figure at which the derivative does **not** exist.

Answers *

✓ Points B, C, and D

○ Points B and C

○ Point D

○ A and D

Problem 13.

Find the intervals of concavity of the function $f(x) = 4x^3 - 3x^2 - 1$

by solving equation $f''(x) = 0$ (see the definition of concavity).

Answers *

✓ Concave up on $(\frac{1}{4},\infty)$ and concave down on $(-\infty,\frac{1}{4})$

○ Concave up on $(\frac{\sqrt{2}}{2},\infty)$ and concave down on $(-\infty,\frac{\sqrt{2}}{2})$

○ Concave up on $(0.5,\infty)$ and concave down on $(-\infty,0.5)$

○ Concave up on $(-\frac{\sqrt{2}}{2},\infty)$ and concave down on $(-\infty,-\frac{\sqrt{2}}{2})$

Problem 14.

The local extrema of $f(x) = -x^3 + 6x^2 + 6$ occur at which of the following x-values?

Answers *

✓ local maximum at $x = 0$, local minimum at $x = 4$

○ local maximum at $x = 4$, local minimum at $x = 0$

○ local minimum at $x = 0, 4$

○ local maximum at $x = 2$

Problem 15.

What is he x-coordinate of the inflection point on the graph of

$$f(x) = -x^3/3 + 5x^2 + 24$$

Answers *

- ⃝ 5
- ⃝ 0
- ✓ -5
- ⃝ -10