

For each problem, find all points of relative minima and maxima.

1) $y = x^3 - 3x^2 + 1$

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

3) $y = x^3 + 3x^2 + 12x + 9$

4) $y = x^3 + 6x^2 + 9x + 1$

For each problem, find all points of absolute minima and maxima on the given interval.

5) $y = -x^3 + 3x^2 - 1$; $[-1, 1]$

6) $y = -x^2 + 8x - 17$; $[3, 6]$

For each problem, find the open intervals where the function is increasing and decreasing.

7) $y = -x^3 + 9x^2 - 24x + 21$

8) $y = -2x^2 - 12x - 14$

9) $y = x^3 - x^2 - 1$

10) $y = -2x^2 + 8x - 4$

For each problem, find all points of relative minima and maxima.

1) $y = x^3 - 3x^2 + 1$

Relative minimum: $(2, -3)$ Relative maximum: $(0, 1)$

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

Relative minimum: $(1, -2)$

No relative maxima.

3) $y = x^3 + 3x^2 + 12x + 9$

No relative minima.

No relative maxima.

4) $y = x^3 + 6x^2 + 9x + 1$

Relative minimum: $(-1, -3)$ Relative maximum: $(-3, 1)$

For each problem, find all points of absolute minima and maxima on the given interval.

5) $y = -x^3 + 3x^2 - 1$; $[-1, 1]$

Absolute minimum: $(0, -1)$ Absolute maximum: $(-1, 3)$

6) $y = -x^2 + 8x - 17$; $[3, 6]$

Absolute minimum: $(6, -5)$ Absolute maximum: $(4, -1)$

For each problem, find the open intervals where the function is increasing and decreasing.

7) $y = -x^3 + 9x^2 - 24x + 21$

Increasing: $(2, 4)$ Decreasing: $(-\infty, 2), (4, \infty)$

8) $y = -2x^2 - 12x - 14$

Increasing: $(-\infty, -3)$ Decreasing: $(-3, \infty)$

9) $y = x^3 - x^2 - 1$

Increasing: $(-\infty, 0), \left(\frac{2}{3}, \infty\right)$ Decreasing: $\left(0, \frac{2}{3}\right)$

10) $y = -2x^2 + 8x - 4$

Increasing: $(-\infty, 2)$ Decreasing: $(2, \infty)$