

RELATIVE EXTREMA AND FIRST DERIVATIVE TEST

Prepared by Ingrid Stewart, Ph.D., College of Southern Nevada Please Send Questions and Comments to ingrid.stewart@csn.edu. Thank you!

Problem 1:

Given
$$f(x) = 2x^3 + x^2 - 20x + 4_{\text{with domain}} (-\infty, \infty)$$
, find

- the coordinates of any relative maximum and minimum points on the graph of the function.
- the intervals over which the function is increasing and decreasing

Problem 2:

Given
$$f(x) = x^{\frac{2}{3}} - 1_{\text{with domain}} (-\infty, \infty)_{\text{find}}$$

- the coordinates of any relative maximum and minimum points on the graph of the function.
- the intervals over which the function is increasing and decreasing

Problem 3:

Given
$$f(x) = \sqrt[3]{x^2 - x - 2}$$
 with domain $(-\infty, \infty)$, find

- the coordinates of any relative maximum and minimum points on the graph of the function.
- the intervals over which the function is increasing and decreasing.

Problem 4:

Given
$$f(x) = x\sqrt{9-x^2}$$
 with domain $[-3,3]$, find

- the coordinates of any relative maximum and minimum points on the graph of the function.
- the intervals over which the function is increasing and decreasing.

Problem 5:

Given
$$f(x) = x\sqrt{2} - 2\cos x$$
 with restricted domain $[-2\pi, 2\pi]$, find

- the x-coordinates ONLY of any relative maximum and minimum points on the graph of the function.
- the intervals over which the function is increasing and decreasing.

Problem 6:

Given
$$f(x) = (x+2)^3 - 4$$
 with domain $(-\infty, \infty)$, find

- the coordinates of any relative maximum and minimum points on the graph of the
- the intervals over which the function is increasing and decreasing.

SOLUTIONS

You can find detailed solutions below the link for this problem set!

NO Relative Maximum

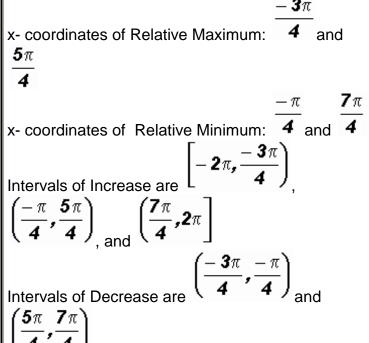
Interval of Increase is (0, co)

Interval of Decrease is (-\infty,0)

Relative Minimum at [0, f(0)] = (0,-1)

1.
Relative Maximum at $[-2, f(-2)] = (-2, 32)$
Relative Minimum at $f(\frac{5}{3}) f(\frac{5}{3}) = (\frac{5}{3}, \frac{-467}{27})$
Intervals of Increase are $(-\infty, -2)$ and $(\frac{5}{3}, \infty)$
Interval of Decrease is $(-2, \frac{5}{3})$
3.
NO Relative Maximum
Relative Minimum at $\begin{bmatrix} \frac{1}{2}, f(\frac{1}{2}) \end{bmatrix} = (\frac{1}{2}, -\frac{3}{4})$
Intervals of Increase are $(\frac{1}{2},2)_{and}$ (2, ∞)
Intervals of Decrease are $(-\infty,-1)_{and}$ $(-1,\frac{1}{2})$

3. Relative Maximum at
$$\begin{bmatrix} \frac{1}{2}, f(\frac{1}{2}) \end{bmatrix} = \begin{pmatrix} \frac{1}{2}, -\frac{3\sqrt{9}}{4} \end{pmatrix}$$
 Relative Minimum at $\begin{bmatrix} \frac{1}{2}, f(\frac{1}{2}) \end{bmatrix} = \begin{pmatrix} \frac{1}{2}, -\frac{3\sqrt{9}}{4} \end{pmatrix}$ Relative Minimum at $\begin{bmatrix} -\frac{3\sqrt{2}}{2}, f(-\frac{3\sqrt{2}}{2}) \end{bmatrix} = \begin{pmatrix} -\frac{3\sqrt{2}}{2}, -\frac{9}{2} \end{pmatrix}$ Intervals of Increase are $\begin{pmatrix} \frac{1}{2}, 2 \end{pmatrix}$ and $\begin{pmatrix} -1, \frac{1}{2} \end{pmatrix}$ Intervals of Decrease are $\begin{pmatrix} -3, -\frac{3\sqrt{2}}{2} \end{pmatrix}$ and $\begin{pmatrix} -\frac{3\sqrt{2}}{2}, 3 \end{pmatrix}$ 5.
$$-3\pi$$



Interval of Increase is
$$\left(-\frac{3\sqrt{2}}{2}, \frac{3\sqrt{2}}{2}\right)$$
Intervals of Decrease are $\left(-3, -\frac{3\sqrt{2}}{2}\right)$ and $\left(\frac{3\sqrt{2}}{2}, 3\right)$

6.

NO Relative Maximum

No Relative Minimum

Intervals of Increase are $\left(-\infty, -2\right)$ and $\left(-2, \infty\right)$.

No Intervals of Decrease