Relative Extrema (Section 4.2)

Warm-up

Given $f(x) = \dfrac{x}{x^2 + 2}$. Find the intervals on which the function is:

a) increasing b) decreasing

Relative Maxima and Minima (Relative Extrema)

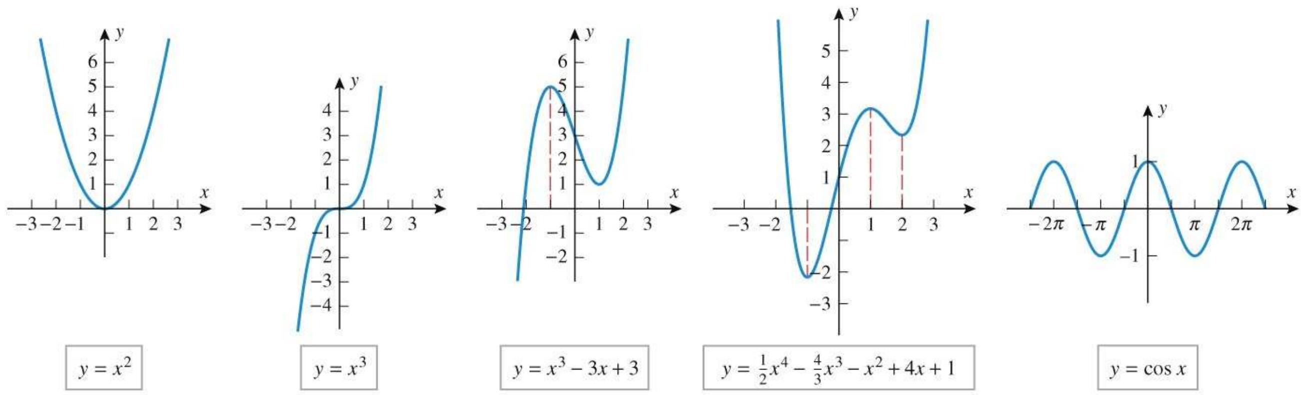

Figure 4.2.2

What do all of the relative maxima and minima have in common? ____________________

____.

Critical Points versus Stationary Points

Critical Points: ____

Stationary Points: ____

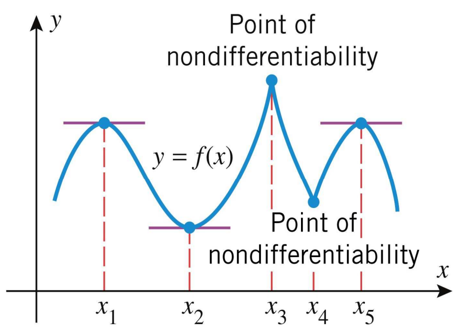

Figure 4.2.3

Critical points are candidates for where relative extrema ***may*** occur.

Relative Extrema (Section 4.2)

Finding Relative Extrema: The First Derivative Test

A relative maximum occurs at a critical point if ____.

A relative minimum occurs at a critical point if ____.

Example 1: Find the relative extrema of $f(x) = 3x^5 - 5x^3$ using the first derivative test.

Example 2: Find the relative extrema of $f(x) = 3x^{5/3} - 15x^{2/3}$ using the first derivative test.

Finding Relative Extrema: The Second Derivative Test

A relative maximum occurs at a stationary point if ____.

A relative minimum occurs at a stationary point if ____.

Example 3: Find the relative extrema of $f(x) = x^3 - 3x + 1$ using the second derivative test.

Relative Extrema (Section 4.2)

Class Work

Find the relative extrema of the following functions using both the first and second derivative tests.

1. $f(x) = 3x^2 - 6x + 1$

2. $f(x) = x^3 - 3x + 3$

3. $f(x) = x^3 - 3x^2 + 3x - 2$

4. $f(x) = (x-1)^4$

Locate the critical points and identify which are stationary points.

5. $f(x) = 4x^4 - 16x^2 + 17$

6. $f(x) = 3x^4 + 12x$