4.3 Derivative Tests

Objectives:

- I can find extremes of a function using the first derivative test

- I can determine concavity of a function using the second derivative

- I can use the second derivative test to find extreme values

The First Derivative Test (for local extrema)

*Find all extreme values and increasing/decreasing intervals

$f(x) = x^4 - 2x^3 + 2$

What does f(x) represent?

What does f '(x) represent?

What does f "(x) represent?

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Concavity and the Second Derivative

Concave up:

Concave down:

Inflection point:

Concavity Test

Analyze the function using the first derivative test and the concavity test

1. $y = \frac{1}{3}x^3 + x^2 - 3x + 2$

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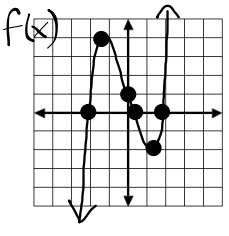
Analyze the function using the first derivative test and the concavity test

$$y = -2x^3 + 6x^2 - 3$$

2. Use the given graph of f (x) to estimate the following.



a) Increasing

b) Decreasing

c) Local Extrema

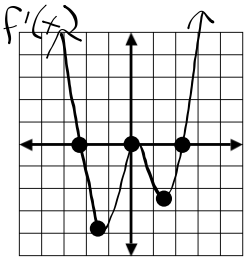
d) Inflection Points

e) Concave up

f) Concave down

4.3

Use the given graph of f '(x) to estimate the following on f(x).



a) Increasing

b) Decreasing

c) Local Extrema

d) Inflection Points

e) Concave up

f) Concave down

How do we find a critical point?

How do we know if a critical point is an extreme value?

How do we find an inflection point?

What is an inflection point?

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Second Derivative Test For Extrema

If f '(c) =0 and f "(c) <0, then f has a local max at x=c

If f '(c)=0 and f "(c) >0, then f has a local min at x=c

Use the second derivative test to final all max/min values of each function

1. $g(x) = -x^3 + 9x$

2. $f(x)=x^5-80x+100$

3. $y=xe^x$