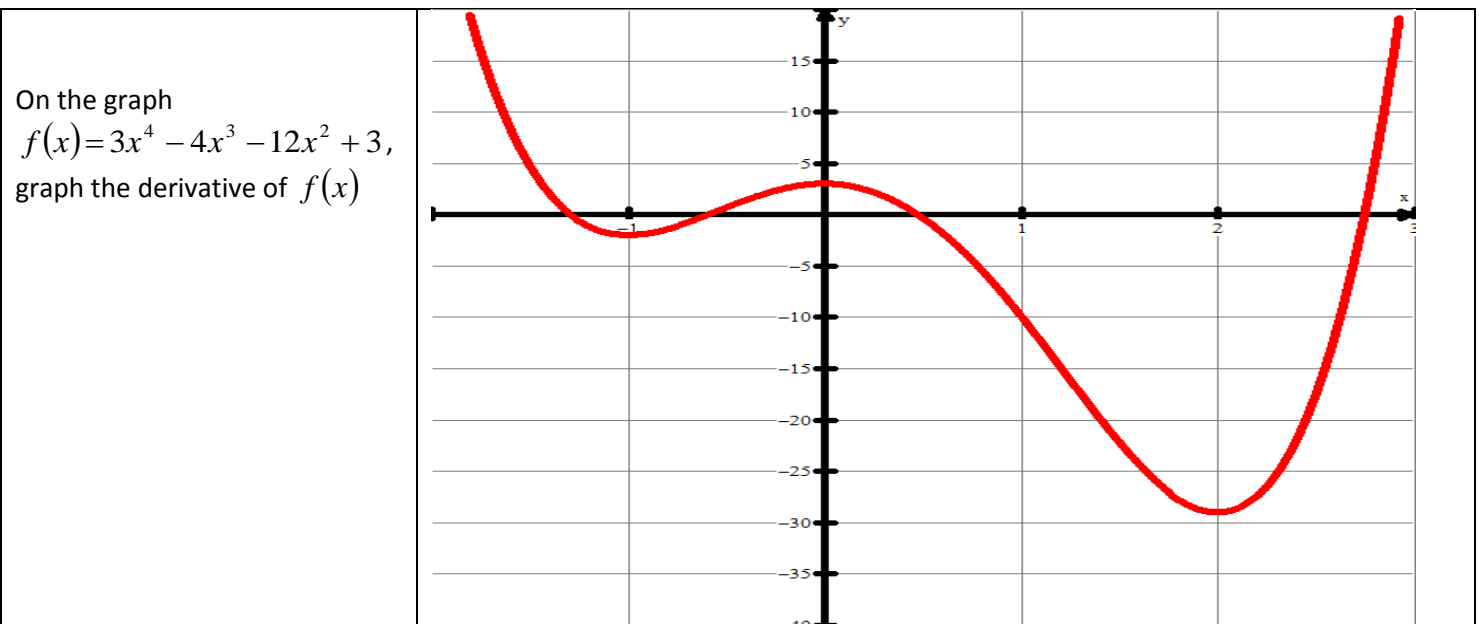


# Lesson 56 – First Derivative Test May 2/20111

(A) Terms

<p>Given a function, <math>f(x)</math>, that is defined on a given interval and let <math>c</math> be a number in the domain. <math>f(c)</math> is the ABSOLUTE or GLOBAL maximum of <math>f(x)</math> on the interval if <math>f(c) &gt; f(x)</math> for every <math>x</math> in the interval. Now, sketch an example of what has just been described</p>	<p>Given a function, <math>f(x)</math>, that is defined on a given interval and let <math>c</math> be a number in the domain. <math>f(c)</math> is the ABSOLUTE or GLOBAL minimum of <math>f(x)</math> on the interval if <math>f(c) &lt; f(x)</math> for every <math>x</math> in the interval. Now, sketch an example of what has just been described.</p>

(B) Review

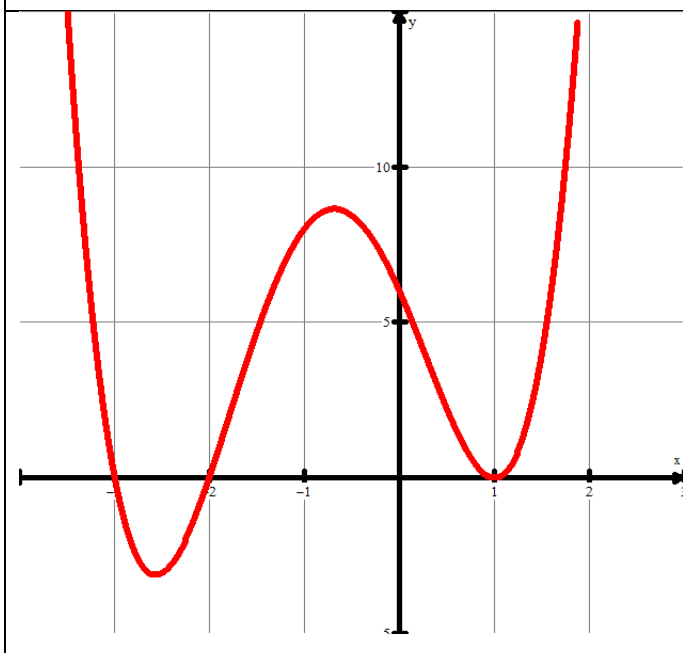
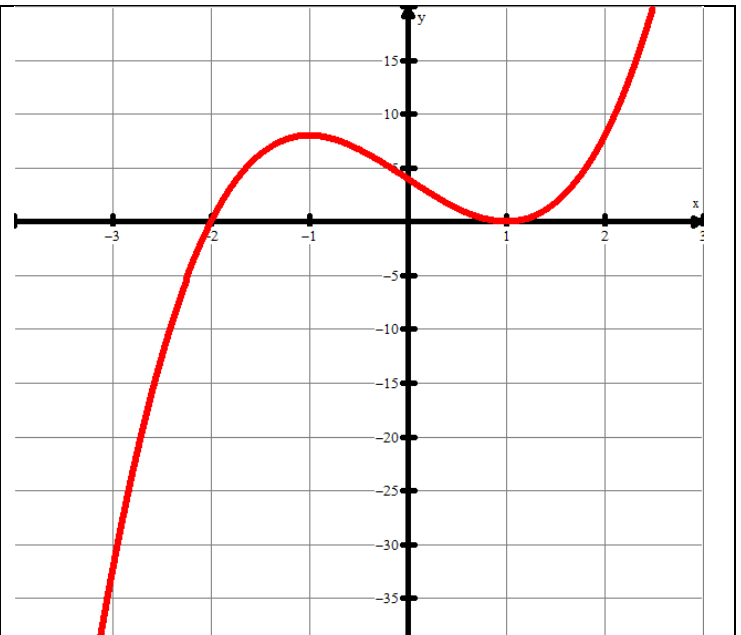
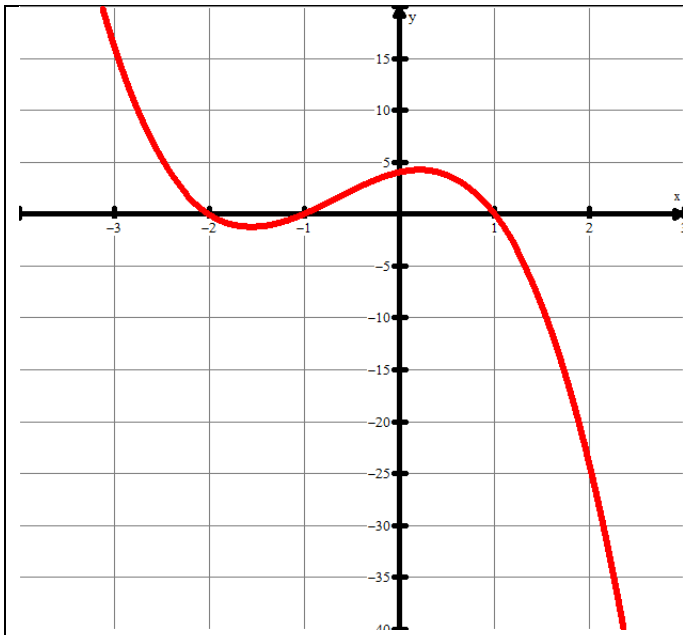


Observations:

- (a)  $F(x)$  has a max at  $x =$  \_\_\_\_\_, and the derivative has a \_\_\_\_\_.
- (b)  $F(x)$  has a min at  $x =$  \_\_\_\_\_, and the derivative has a \_\_\_\_\_.
- (c)  $F(x)$  increases on  $x =$  \_\_\_\_\_, and the derivative \_\_\_\_\_.
- (d)  $F(x)$  decreases on  $x =$  \_\_\_\_\_, and the derivative \_\_\_\_\_.

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## (C) Working with the Derivative – Graphically



## (D) First Derivative Test – Summary:

- If  $f'(x) > 0$ , then  $f(x)$  \_\_\_\_\_.
- If  $f'(x) < 0$ , then  $f(x)$  \_\_\_\_\_.
- if  $f'(x) = 0$ , then  $f(x)$  \_\_\_\_\_.

(E) First Derivative Test – Algebra Examples

1. Find the local max/min values of  $y = x^3 - 3x + 1$
2. Find the local max/min values of  $g(x) = x^4 - 4x^3 - 8x^2 - 1$
3. Find the absolute minimum value of  $f(x) = x + 1/x$  for  $x > 0$
4. Determine the absolute extrema for the following function and interval:
  - a.  $g(x) = 2x^3 + 3x^2 - 12x + 4$  on  $[-4, 2]$
  - b.  $f(x) = x^4 - 4x^3 + 4x^2$
  - c.  $f(x) = x^4 - 4x^3$
  - d.  $f(x) = 3x^5 - 25x^3 + 60x$
  - e.  $f(x) = 3x^4 - 16x^3 + 18x^2 + 2$