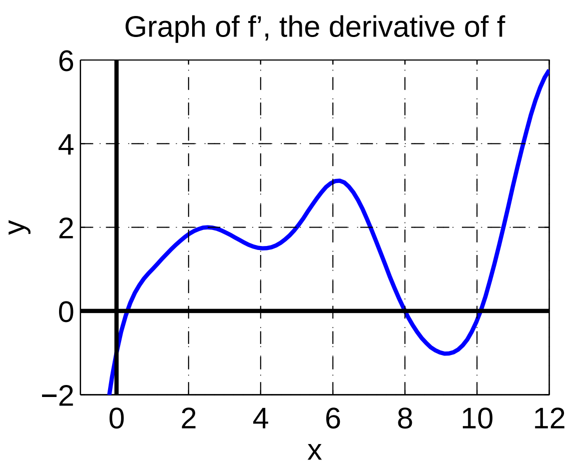
Spring 2015 Math 151

Week in Review 9
courtesy: Amy Austin
(Covering 5.1-5.3)

Section 5.1

1. Given the graph of $f'(x)$ find intervals if increase/decrease, local extrema, intervals of concavity and inflection points.



2. Sketch a graph satisfying:

   a.) Domain: All real numbers

   b.) $f(-1) = -2$, $f(0) = 0$, $f(2) = 3$

   c.) $f'(x) < 0$ for $x < -1$ and $x > 2$

   d.) $f'(x) > 0$ if $-1 < x < 2$

   e.) $f''(x) > 0$ if $x < 0$ and $f''(x) < 0$ if $x > 0$

Section 5.2

3. For the following functions, identify all critical values.

   a.) $f(x) = 4x^3 - 9x^2 - 12x + 3$

   b.) $f(x) = x^2 e^{2x}$

   c.) $f(x) = |x^2 - 2x|$

   d.) $f(x) = (x^2 - x)^{1/3}$

   e.) $f(x) = \dfrac{x+1}{x-2}$

4. Find the absolute and local extrema for the following functions by graphing.

   a.) $f(x) = 1 - x^2$, $-1 < x \leq 2$

   b.) $f(x) = \begin{cases} x^2 & \text{if } -1 \leq x < 0 \\ 2 - x^2 & \text{if } 0 \leq x \leq 1 \end{cases}$

5. Find the absolute extrema for:

   a.) $f(x) = x^3 - 12x + 1$ over the interval $[-1, 5]$

   b.) $f(x) = x \ln x$ over the interval $[1, 3]$

6. Sketch a graph of a function satisfying the following conditions:

   a.) $x = 2$ is a critical number, but $f(x)$ has no local extrema.

   b.) $f(x)$ is a continuous function with a local maximum at $x = 2$, but $f(x)$ is not differentiable at $x = 2$.

Section 5.3

7. State the Mean Value Theorem. Verify $f(x) = x^2$ satisfies the Mean Value Theorem on the interval $[-1, 2]$. Find all c that satisfies the conclusion of the Mean Value Theorem.

8. Find the intervals where the given function is increasing or decreasing and identify all local extrema:

   a) $f(x) = 3x^4 + 4x^3 - 12x^2 + 8$

   b) $y = \tan^{-1}(x^2)$

   c) $f(x) = \dfrac{x}{(x-1)^2}$

   d) $f(x) = (x^2 - x)^{1/3}$

   e) $f(x) = x \sin x + \cos x$ on $[0, 2\pi]$

9. Determine the intervals where the given function is concave up or concave down and identify all inflection points for $f(x) = x^5 + 5x^4$

10. Given $f(-3) = 4$, $f'(-3) = 0$, $f''(-3) = 7$, $f(2) = -5$, $f'(2) = 0$, and $f''(2) = -6$, identify any local extrema of f.