# Spring 2012 Math 151

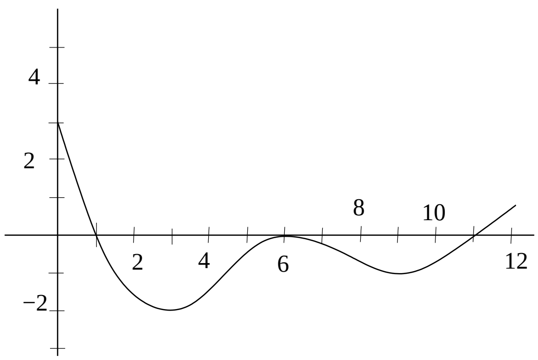
**Week in Review # 9**
sections: 5.1, 5.2, 5.3
*courtesy: Joe Kahlig*

## Section 5.1

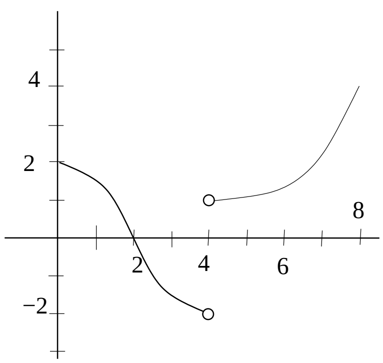
Answer these questions for each of the graphs.

(A) On what intervals is $f$ is increasing? decreasing?
(B) On what intervals is $f$ concave up? concave down?
(C) At what values of $x$ does $f$ have a local maximum or minimum?
(D) At what values of $x$ does $f$ have an inflection point?
(E) Assuming that $f$ is continuous and $f(0) = 0$, sketch a graph of $f$.

1. The graph of the derivative, $f'(x)$, is shown below.




2. The graph of the derivative, $f'(x)$, is shown below.




## Section 5.2

1. For the following functions, find all critical values.

   (a) $f(x) = xe^{2x}$

   (b) $f(x) = |x^2 - 4x|$

   (c) $f(x) = x^{\frac{1}{3}}(8 - x)$

2. Find the absolute and local extrema for these functions by graphing.

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

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

3. Find the absolute maximum and absolute minimum of the given function on the given interval

(a) $f(x) = x^3 - 2x^2 + x - 5$ on $[-1, 3]$

(b) $f(x) = x^{\frac{5}{3}} + 5x^{\frac{2}{3}}$ on $[-1, 4]$

(c) $f(x) = \frac{1}{(x-1)^2}$, on $[0, 3]$

4. Sketch a graph of a function $f$ satisfying the following conditions.

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

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

(c) $f$ is defined on the interval $[1, 5]$ but does not have an absolute maximum.

## Section 5.3

5. Find the value of $c$ in the interval $[1, 4]$ that satisfies the conclusion of the Mean Value Theorem for $f(x) = x^3 + 5$

6. Find the intervals where the function is increasing or decreasing and identify all local extrema.

   (a) $f(x) = xe^{x^2 - 3x}$

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

   (c) $f(x) = x\ln(x)$

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

7. Determine the intervals where the given function, $f(x)$ is concave up or concave down and identify all inflection points:

   (a) $f(x) = 5x^7 - 7x^6 + 10$

   (b) $f(x) = x \ln(x-2)$

8. Given $f(3) = 8$, $f'(3) = 0$, $f''(3) = 6$,
   $f(7) = 1$, $f'(7) = 0$, and $f''(7) = -5$, identify any local extrema of $f$.

9. Find the values of $A$ and $B$ so that the function $f(x) = Ax^3 - 36x^2 + Bx + 7$ will have an inflection point at $x = 3$ and will have a rate of change of $-36$ at $x = 2$.