Name _Answer Key_   Due Date: Thursday, March 9, 2017

Math 1411   Score: _____/30

Derivative Application Review

I will only grade work that is written on this sheet. No attachments for work.

1. Find the (absolute) maximum and minimum values of $f(x) = x^3 - 3x + 2$ over the interval $[-2, \frac{3}{2}]$.

   1st Derivative
   end points
   critical numbers

   $f'(x) = 3x^2 - 3$
   $0 = 3(x^2 - 1)$
   $x = \pm 1$

   ep $x = -2$ $f(-2) = 0$ — min
   cn $x = -1$ $f(-1) = 4$ — max
   cn $x = 1$ $f(1) = 0$ — min
   ep $x = \frac{3}{2}$ $f(\frac{3}{2}) = \frac{7}{8}$

2. Find the intervals of increasing/decreasing, concavity, all relative extrema and points of inflection for $f(x) = x^3 + 3x^2 - 9x - 13$

   $f'(x) = 3x^2 + 6x - 9$ $f''(x) = 6x + 6$
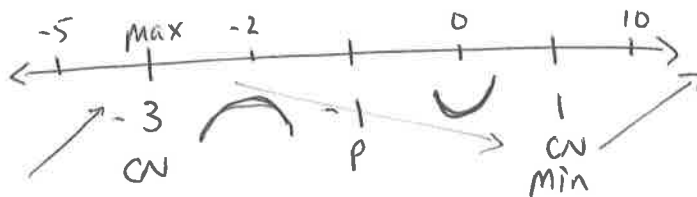 $0 = 3(x^2 + 2x - 3)$ $0 = 6(x + 1)$
   $0 = 3(x + 3)(x - 1)$ $x = -1$
   $x = -3, 1$

   INC $(-\infty, -3), (1, \infty)$
   DEC $(-3, 1)$
   CC up $(-1, \infty)$
   CC DOWN $(-\infty, -1)$
   Min pt $(1, -18)$
   Max pt $(-3, 14)$
   Point of inflection $(-1, -2)$

   $f'(-5) = +$
   $f'(0) = -$
   $f'(10) = +$

   $f''(-2) = -$
   $f''(0) = +$

3. Find all intervals of increasing/decreasing, concavity, and all relative extrema and points of inflection in order to sketch the graph of $f(x) = 3x^5 - 20x^3$

$f'(x) = 15x^4 - 60x^2$

$0 = 15x^2(x^2 - 4)$

$0 = 15x^2(x+2)(x-2)$

$x = 0 \quad x = -2 \quad x = 2$

$f''(x) = 60x^3 - 120x$

$0 = 60x(x^2 - 2)$

$0 = 60x(x + \sqrt{2})(x - \sqrt{2})$

$x = 0 \quad x = -\sqrt{2} \quad x = \sqrt{2}$

INC $(-\infty, -2), (2, \infty)$

Dec $(-2, 0), (0, 2)$

ccup $(-\sqrt{2}, 0), (\sqrt{2}, \infty)$

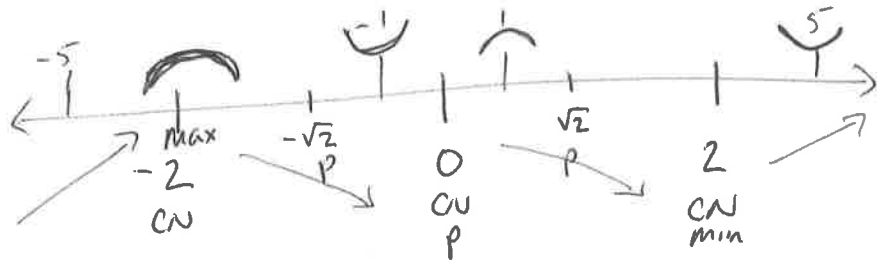cc Down $(-\infty, -\sqrt{2}), (0, \sqrt{2})$

Max $(-2, 64)$

Min $(2, -64)$

POI $(-\sqrt{2}, 39.6)$
$(0, 0)$
$(\sqrt{2}, -39.6)$

$f'(-5) = +$ $f'(-1) = -$ $f'(1) = -$ $f'(5) = +$

$f''(-5) = -$ $f''(-\frac{1}{1}) = +$ $f''(1) = -$ $f''(5) = +$