Quiz 16

November 2, 2016

Show all work and circle your final answer.

1. Let $f(x) = -x^3 - 3x^2 - 3x + 9$. Find the following:
   (a) The open intervals on which f is increasing
   (b) The open intervals on which f is decreasing
   (c) The coordinates of any relative maximums
   (d) The coordinates of any relative minimums

$$f'(x) = -3x^2 - 6x - 3 \overset{\text{set}}{=} 0$$
$$-3(x^2+2x+1) = 0$$
$$-3(x+1)^2 = 0$$
$$x = -1$$

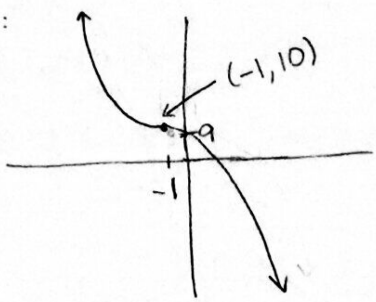
CP:

f' $-$ $-$

x -1

a) never increasing
b) $(-\infty, \infty)$ decreasing
c) no relative maximums
d) no relative minimums

Note: Here's the graph:



2. Suppose $g'(x) = xe^x$. Find the following:

(a) The open intervals on which g is increasing

(b) The open intervals on which g is decreasing

(c) The x-value of any relative maximums

(d) The x-value of any relative minimums

(e) The open intervals on which g is concave up

(f) The open intervals on which g is concave down

(g) The x-value of any inflection points

$g'(x) = xe^x \overset{\text{set}}{=} 0$

CP: $x = 0$ $\quad (e^x > 0$ for all $x)$

g': $-$ | $+$

x: 0

a) increasing on $(0, \infty)$

b) decreasing on $(-\infty, 0)$

c) no relative maximums

d) relative min at $x = 0$

$g''(x) = e^x + xe^x = (1+x)e^x \overset{\text{set}}{=} 0$

Possible IP's: $x = -1$ $\quad (e^x > 0$ for all $x)$

g'': $-$ | $+$

x: -1

e) concave up on $(-1, \infty)$

f) concave down on $(-\infty, -1)$

g) IP at $x = -1$ since g changes concavity.

Note: One possible $g(x)$ is $g(x) = xe^x - e^x$: