Name: Solutions

Math 1300-005 - Spring 2017

Quiz 5 - 2/17/17

On my honor, as a University of Colorado at Boulder student, I have neither given nor received unauthorized assistance on this work.

Signature: _____

Guidelines: You are permitted to use notes, the book, in-class worksheets/solutions, and your classmates on this quiz. Computers and graphing technology of any kind, including calculators, are not allowed (exceptions made for those who have an e-book). Please show all work and clearly denote your answer.

1. (a) Let $f(x) = x^2 - 3$ and $g(x) = 4x + 1$. Find $f'(x)$ and $g'(x)$.

$f'(x) = 2x$, $g'(x) = 4$

(b) Based on part (a), what is $f'(x)g'(x)$?

$f'(x)g'(x) = (2x)(4) = \boxed{8x}$

(c) Let $h(x) = (x^2 - 3)(4x + 1)$. What is $h'(x)$?

$h(x) = 4x^3 + x^2 - 12x - 3$,

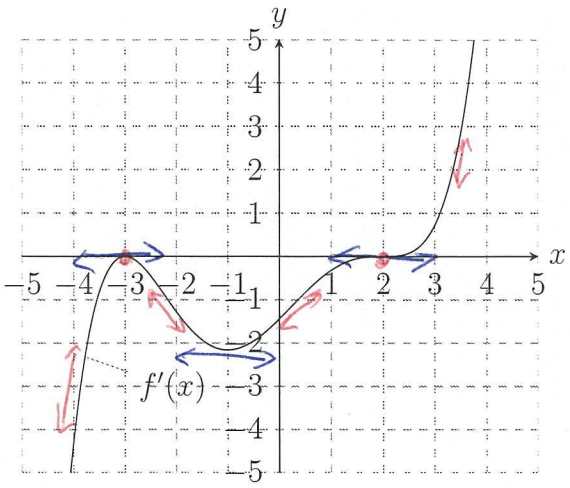
so $\boxed{h'(x) = 12x^2 + 2x - 12}$

(d) True or False? Please explain your answer.

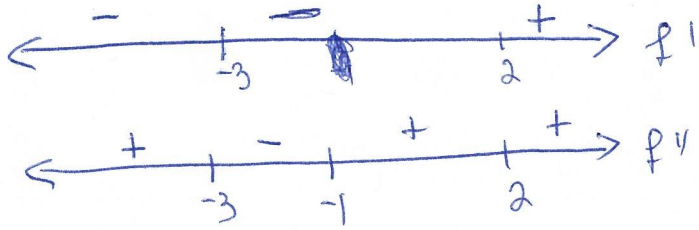
$$\frac{d}{dx}(f(x)g(x)) = f'(x)g'(x)$$

False, (a), (b), (c) above provide a counterexample since $8x \neq 12x^2 + 2x - 12$.

2. Consider the graph of the *derivative* $f'(x)$ of a function $f(x)$. Answer the following questions.



(a) Construct sign charts for f' and f''. Be sure to label which is which!



(b) On what interval(s) is f increasing? On what interval(s) is f decreasing? State the location of any local maximums or local minimums, if they exist. Be sure to justify ALL of your answers here.

f increasing $(2, \infty)$ since $f' > 0$ there.

f decreasing $(-\infty, -3) \cup (-3, 2)$ since $f' < 0$ there.

Local max: none, f' never goes (+) to (−)

Local min: at $x = 2$, since f' goes (−) to (+) there.

(c) On what interval(s) is f concave up? On what interval(s) is f concave down? State the location of any inflections points, if they exist. Be sure to justify ALL of your answers here.

f concave up $(-\infty, -3) \cup (-1, 2) \cup (2, \infty)$ since $f'' > 0$ there.

f concave down $(-3, -1)$ since $f'' < 0$ there.

Inflection points at $x = -3$, $x = -1$ b/c f'' changes sign at these x-values.