Worksheet 3

Math 251, Summer 2017

Name: _____

Directions

- This counts as your "attendance" for the day. You must give this to me today to get credit for it.
- You may leave if you finish the packet.
- You may work in groups, and you can ask me for assistance.
- I grade this worksheet based on completion, not accuracy; however, you should strive for completely correct answers in order to make sure you understand the material.

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1. Find the derivatives of the functions shown below.

   (a) $f(x) = 186.5$

   (b) $g(t) = 2 - \frac{2}{3}t$

   (c) $r(x) = \frac{1}{x} + \sin(x)$

   (d) $\ell(s) = 2s^3 + s$

   (e) $f(x) = e^x + x$

   (f) $g(t) = \sqrt[4]{t} - 13e^t - \cos(t)$

   (g) $h(x) = -16t^2 + 20t + 100$

   (h) $f(x) = \frac{1}{2}t^6 - 3t^4 + t$

2. Find the equation of the tangent line to $\sqrt{x}$ at $x = 9$.

3. Find the slope of the tangent line to $f(x) = \frac{1}{\sqrt{x}}$ at $x = 2$. Make a sketch of $f(x)$ and its tangent line.

4. Derivatives don't always work the way you want, especially with products and quotients. Consider $f(x) = (x-2)(2x+3)$.

   (a) Find $f'(x)$ by first distributing.

   (b) Is this the same as doing $(x-2)' \times (2x+3)'$?

   (c) Based on this, what do you think of the validity of the "formula" $\frac{d}{dx}(f(x)g(x)) = f'(x)g'(x)$?

5. The derivative of a function is *also* a function, so there's no reason why we couldn't take the derivative *again*. We call this (very creatively) the *second derivative*. That is, given $f(x)$, we calculate $(f')'$, the derivative of the derivative. We usually write $f''(x)$ for this instead. Calculate $f''(x)$ for the following functions.

   (a) $f(x) = x^2$.

   (b) $f(x) = \frac{1}{x}$.

6. Optimize (find max's and min's) of the functions below on the given intervals using the method outlined in class.

   (a) $f(x) = -4x^2 - 2x + 3$, on $[-2, 0]$.

   (b) $g(x) = e^x - 2x$ on $[-1, 1]$