Name: Solutions _____ / 25

There are 25 points possible on this quiz. *You should be able to complete it without using your notes or textbook or a calculator — this is practice for your exams!* If you needed to look something up, you should to me about questions you might have. **Show all work for full credit** and use some words or sentences to help communicate your answers.

1. [15 points] Find the derivative for each function below. You do not need to simplify. You do need to use parentheses correctly.

a. $f(x) = \csc(x) + \tan\left(\frac{\pi}{6}\right)$

$f'(x) = -\csc(x)\cot(x) + 0$

b. $y = \sec(6x^3)$

$y' = \sec(6x^3)\tan(6x^3)(18x^2)$

c. ~~$g(\theta) = \theta^5(\cot(t))^4$~~ ← INCOHERENT.

Did not grade. The variable was supposed to be θ.

d. $h(t) = \left(\sin\left(\frac{\pi}{2}t\right)\right)^5$

$h'(t) = 5\left(\sin\left(\frac{\pi}{2}t\right)\right)^4 \cos\left(\frac{\pi}{2}t\right)\left(\frac{\pi}{2}\right)$

e. $y = \sqrt[3]{\tan\left(\frac{x}{5}\right) - 4x} = \left(\tan\left(\frac{x}{5}\right) - 4x\right)^{1/3}$

$y' = \frac{1}{3}\left(\tan\left(\frac{x}{5}\right) - 4x\right)^{-2/3}\left(\left(\sec\left(\frac{x}{5}\right)\right)^2\left(\frac{1}{5}\right) - 4\right)$

2. [5 points] Find $f''(x)$ for the function $f(x) = \sin(5x^{1/3})$. You do not need to simplify your final answer.

$f'(x) = \cos(5x^{1/3})(5 \cdot \frac{1}{3} x^{-2/3}) = \left(\cos(5x^{1/3})\right)\left(\frac{5}{3} x^{-2/3}\right)$,

$f''(x) = \cos(5x^{1/3})\left(\frac{5}{3}\left(\frac{-2}{3}\right)x^{-5/3}\right) + \left(\frac{5}{3}x^{-2/3}\right)\left(-\sin(5x^{1/3})\left\{5\left(\frac{1}{3}x^{-2/3}\right)\right\}\right)$

$= -\frac{10}{9} x^{-5/3} \cos(5x^{1/3}) - \frac{25}{9} x^{-4/3} \sin(5x^{1/3})$ ← but you did not need to simplify

or

$-\left(\frac{5}{3} x^{-2/3}\right)^2 \sin(5x^{1/3})$

3. [5 points] Let $g(x) = (x^2 - 6x)^3$.

a. Find $g'(x)$.

$g'(x) = 3(x^2 - 6x)^2(2x - 6)$

b. Find all x-values where the graph of $g(x)$ has a horizontal tangent. Show your work, and make it clear what you are calculating.

$g'(x) = 0 \Rightarrow 3(x^2 - 6x)^2(2x - 6) = 0$

$\Rightarrow (x^2 - 6x)^2 = 0$ or $2x - 6 = 0 \Rightarrow$

$x^2(x - 6) = 0$

$x = 0$ or $x = 6$ or $x = 3$

The function $g(x)$ has a horizontal tangent at $x =$ 0 or $x = 6$ or $x = 3$.