Corrected

Math 234 BD6 Quiz 5 (2.4, 2.6) **Name (Last,First):** Solutions

You must show all your work to receive credit.

1.] (2 pts) Differentiate the function; simplify your answer.

$h(x) = (4x-3)^{-1/2}$

$h'(x) = -\frac{1}{2}(4x-3)^{-\frac{1}{2}-1}(4x-3)' = -\frac{1}{2}(4x-3)^{-3/2}\cdot(4)$

$= -2(4x-3)^{-3/2}$ or $\frac{-2}{\sqrt{(4x-3)^3}}$.

2.] (3 pts) Differentiate the function; fully simplify your answer (so that the numerator and denominator have no common factors).

$f(x) = \frac{2x+5}{(1-2x)^3}$ $\quad f'(x) = \frac{(2x+5)'(1-2x)^3 - (2x+5)\left[(1-2x)^3\right]'}{\left[(1-2x)^3\right]^2}$

$= \frac{2(1-2x)^3 - (2x+5)\left[3(1-2x)^2(1-2x)'\right]}{(1-2x)^6} = \frac{2(1-2x)^3-(2x+5)(3)(1-2x)^2(-2)}{(1-2x)^6}$

$= \frac{2(1-2x)-(2x+5)(-6)}{(1-2x)^4} = \frac{8x+32}{(1-2x)^4}$.

3.] (2pts) Does the tangent line to the graph of $f(x)$ ever become horizontal? Justify your answer. If 'yes', give some x value which makes the tangent line horizontal.

$f(x) = \left(1+\sqrt{x^3}\right)^4$ $\quad f'(x) = 4\left(1+x^{3/2}\right)^3\left(1+x^{3/2}\right)' = 4\left(1+x^{3/2}\right)^3\left(\frac{3}{2}x^{1/2}\right)$

$= 6x^{1/2}\left(1+x^{3/2}\right)^3$.

orrected: $\frac{3}{2}\cdot 4 = 6$ not $\frac{3}{2}$

Yes, $x=0$ makes $f'(0) = 6(0)(1+0)^3 = 0$.

4.] (3pts) The equation below describes a curve; use implicit differentiation to find the slope of the tangent line at the point $(1, \frac{1}{2})$. (Remember that y is a function of x)

$xy + \frac{1}{y} = x$

We want y' evaluated at $(1,\frac{1}{2})$: $x=1, y=\frac{1}{2}$. First, find y'

① $\left(xy+\frac{1}{y}\right)' = x'$

$(xy)' + \left(\frac{1}{y}\right)' = 1$

$(xy' + x'y) + (-y^{-2}y') = 1$

$xy' + 1y - y^{-2}y' = 1$

② $xy' - y^{-2}y' = 1-y$

$\left(x - \frac{1}{y^2}\right)y' = 1-y$

$y' = \frac{1-y}{x-\frac{1}{y^2}}$.

③ $y'\Big|_{(1,\frac{1}{2})} = \frac{1-\left(\frac{1}{2}\right)}{(1)-\frac{1}{\left(\frac{1}{2}\right)^2}}$

$= \frac{\frac{1}{2}}{1-4} = \frac{1}{2\cdot(-3)}$

$= \boxed{-\frac{1}{6}} = m_{tan}$