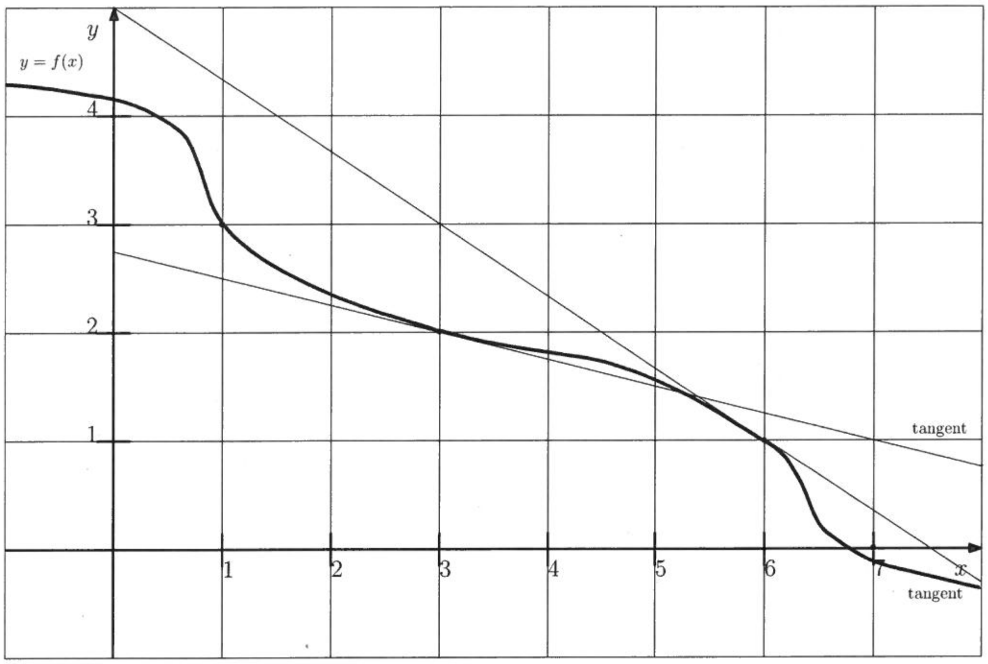
Math 1210: Quiz #5 **Fall 2017**

Name: Solution	A#:	Section: H

[8] 1. Let f be a function with graph $y = f(x)$ given below. Let $g = f^{-1}$ be its inverse function.



Fill in the following.

(a) $g(3) =$ 1

(b) $\lim_{h\to 0} \frac{f(3+h)-f(3)}{h} =$ $f'(3) = -\frac{1}{4}$

(c) The instantaneous rate of change of $f(x)$ when $x = 6$ is $-\frac{2}{3}$

(d) $g'(1) =$ $\frac{1}{f'(6)} = \frac{1}{-\frac{2}{3}} = -\frac{3}{2}$

(e) If $h(x) = f(2x^2 - 5)$, then $h'(2) =$ $8 \cdot f'(8-5) = 8 \cdot (-\frac{1}{4}) = \boxed{-2}$ $h'(x) = 4x \cdot f'(2x^2-5)$

(f) If $k(x) = g(x)\ln(x)$, then $k'(1) =$ $g'(1)\ln(1) + \frac{g(1)}{1} = 0 + 6 = \boxed{6}$ $k'(x) = g'(x)\ln(x) + \frac{g(x)}{x}$

(g) If $F(x) = \tan^{-1}(f(x))$, then $F'(3) =$ $f'(3) \cdot \frac{1}{f^2(3)+1} = (-\frac{1}{4}) \cdot \frac{1}{4+1} = \boxed{\frac{-1}{20}}$ $F'(x) = f'(x) \cdot \frac{1}{(f(x))^2+1}$

(h) Tangent line to the curve $y = 2f(x)$ at $x = 6$ is

$y' = 2f'(x)$

at $x = 6$, $m = 2f'(6) = 2 \cdot \frac{-2}{3} = \boxed{\frac{-4}{3}}$

$y - 2 = \frac{-4}{3}(x-6)$

$y = \frac{-4}{3}x + 8 + 2$

$\boxed{y = -\frac{4}{3}x + 10}$

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[4] 2. Compute the derivative. **Do not simplify.**

3. $\frac{d}{dt}\left(\sin^{-1}(t^2) + \sec(e^t) + \tan^{-1}(e) + \ln(t^3 - 2)\right)$

$$= 2t \cdot \frac{1}{\sqrt{1-t^4}} + e^t \cdot \sec(e^t) \cdot \tan(e^t) + 0 + 3t^2 \cdot \frac{1}{t^3-2}$$

$$= \frac{2t}{\sqrt{1-t^4}} + e^t \cdot \sec(e^t) \tan(e^t) + 0 + \frac{3t^2}{t^3-2}$$

[8] 4. Consider the curve given by $xy^2 = 5 + x^2 + y$. Find the equation of the tangent line given to the curve at the point $(3, -2)$.

Implicit Diff:

$$y^2 + x \cdot 2yy' = 0 + 2x + y'$$

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

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

At $(3,-2)$ the slope is: $m = \frac{2(3) - (-2)^2}{2 \cdot 3 \cdot (-2) - 1} = \boxed{\frac{-2}{13}}$

The equation of tangent line is:

$$y + 2 = \frac{-2}{13}(x - 3)$$

$$y = \frac{-2}{13}x + \frac{6}{13} - 2$$

$$\boxed{y = \frac{-2}{13}x - \frac{20}{13}}$$

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