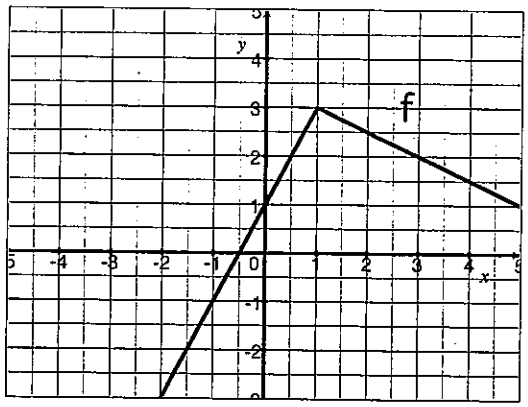
TMATH 124: Quiz 3

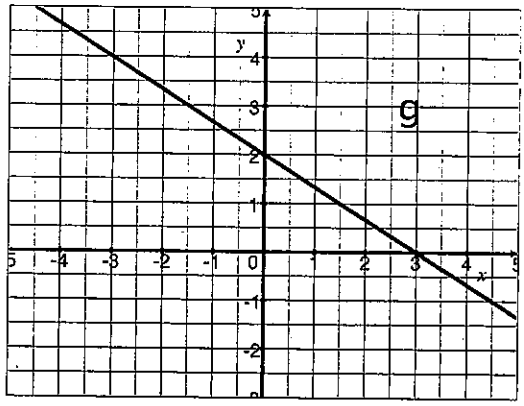
Key

Show *all* your work (numerically, algebraically, or geometrically) for each and simplify. No credit is given without supporting work. No calculators or notes are allowed.

1. [4] (CC9 #2) Use the graphs of f and g on the left and right respectively to estimate the following:

graphing





$(f \cdot g)'(0)$ product rule (+.5)

$f(0)g'(0) + f'(0)g(0)$

$= (1)(-2/3) + (2)(2)$ } graph reading (+.5)

(+.5) (+.5)

$= -2/3 + 4$

$= -2/3 + 12/3 = 10/3$

$\frac{d}{dx}(f \circ g)|_{x=3}$ chain rule (+.5)

$f'(g(3))g'(3)$ (+.5)

$f'(0) \cdot (-2/3)$

(+.5) (+.5)

$2 \cdot -2/3 = -4/3$

2. (WebHW9 #10) [3] Find the equation of the line tangent to $\sin(\sin(x))$ when $x = 4\pi$.

$g(x)$

(+.5) looking for $y = mx + b$

m = slope of line tangent to g when $x = 4\pi$

(+.5) $= g'(4\pi)$

finding g':

(+1) outside function $\sin u$, outside' $= \cos u$; inside function $\sin x$, inside' $= \cos x$

Chain Rule

$f'(g(x))g'(x) = f'(\sin x) \cdot \cos x$

$= \cos(\sin x) \cdot \cos x$

So $m = g'(4\pi)$

$= \cos(\sin 4\pi)(\cos 4\pi)$

plug in 4π (+.5)

$= \cos(0)\ (1)$

$= (1)(1) = 1$

(+.5) passes thru $(4\pi, \sin(\sin 4\pi))$

$= (4\pi, \sin(0)) = (4\pi, 0)$

so

$y - 0 = 1(x - 4\pi)$

or

$y = x - 4\pi$

3. (ExtraPractice Day 9) [3] Find where the function $f(x) = \frac{5x}{1+3x^2}$ has a horizontal tangent line.

find x so that

slope of line tangent to f = slope of horizontal line (+1)

ie find x so that

$f'(x) = 0$

ie find x so that

$\frac{5-15x^2}{(1+3x^2)^2} = 0$

$\Rightarrow 5 - 15x^2 = 0$

$\Rightarrow -15x^2 = -5$

$\Rightarrow x^2 = 5/15$

$\Rightarrow x = \pm\sqrt{1/3}$ algebra (+1)

finding f':

(+1) Quotient Rule $f'(x) = \frac{(1+3x^2)(5x)' - (5x)(1+3x^2)'}{(1+3x^2)^2}$

$f'(x) = \frac{(1+3x^2)(5) - 5x(6x)}{(1+3x^2)^2}$

$= \frac{5 + 15x^2 - 30x^2}{(1+3x^2)^2} = \frac{5 - 15x^2}{(1+3x^2)^2}$