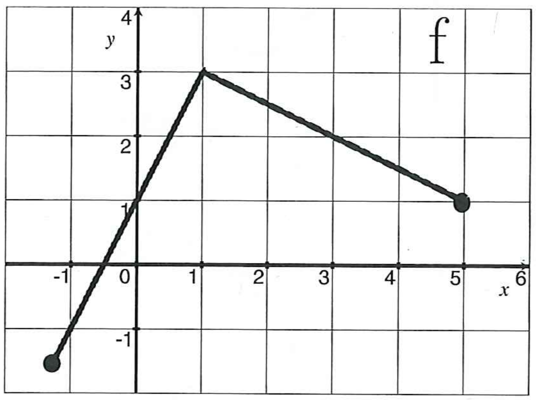
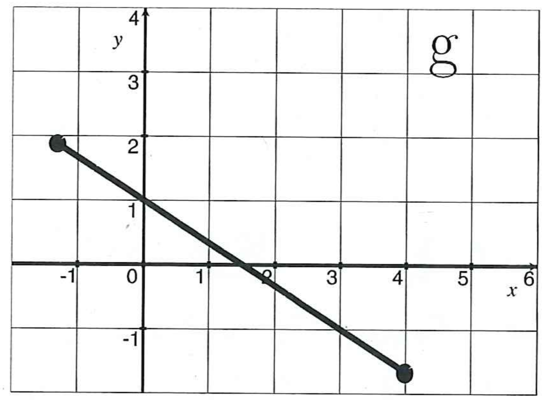
TMATH 124 Quiz 3

Key

Show *all* your work (numerically, algebraically, or geometrically) for each and simplify. Supporting work is needed to earn credit. There are two sides of this quiz.

1. [4] (Products Activity #1 & §3.4 #164) Let f be the function graphed on the left and g be the function graphed on the right.





Estimate the following (if possible):

(a) $(f \cdot g)'(3)$ $= f(3)g'(3) + f'(3)g(3)$ product rule (+.5)

$= 2 \cdot \left(\frac{-2}{3}\right) + \left(\frac{-1}{2}\right)(-1)$ (+.5) (+.5) (+.5)

$= \frac{-4}{3} + \frac{1}{2} = \frac{-8}{6} + \frac{3}{6} = \frac{-5}{6}$

(b) $\frac{d}{dx}(f(g(x))|_3$ $= f'(g(3))\, g'(3)$ chain rule (+.5)

$= f'(-1) \cdot (-2/3)$ (+.5) (+.5)

(+.5)

$= 2 \cdot (-2/3)$

$= \frac{-4}{3}$

note $\frac{\pi x}{2} = \frac{\pi}{2} x$ or a constant times x

dont need the quotient rule?

2. [3] (WebHW8 #13) Let $\alpha(x) = 2\cos(\frac{\pi x}{2})$. Find the equation for the line tangent to α when $x = \frac{1}{3}$.

(+.5) Looking for a line $y - y_1 = m(x - x_1)$

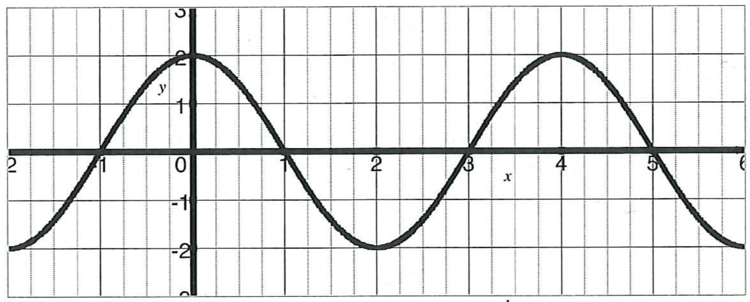
m = slope of line tangent to α @ $x = \frac{1}{3}$

$= \alpha'(\frac{1}{3})$ (+.5)

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

$= -\pi \sin(\frac{\pi}{6})$

$= -\pi \frac{1}{2} = -\frac{\pi}{2}$ (+.5) ≈ 1.57



$\alpha'(x) = [2\cos(\frac{\pi}{2}x)]' = 2\,[\cos \frac{\pi}{2}x]'$

(+1) chain $f(x) = \cos x$ $\quad f'(x) = -\sin x$

$g(x) = \frac{\pi}{2}x$ $\quad g'(x) = \frac{\pi}{2}$

$= 2\, f'(g(x)) \cdot g'(x)$

$= 2\, f'(\frac{\pi}{2}x) \cdot \frac{\pi}{2} = 2(-\sin(\frac{\pi}{2}x))\frac{\pi}{2}$

$= -\pi \sin(\frac{\pi}{2}x)$

Passes thru $(\frac{1}{3}, \alpha(\frac{1}{3}))$ (+.5)

or $(\frac{1}{3}, 2\cos(\frac{\pi}{2}\cdot\frac{1}{3})) = (\frac{1}{3}, 2\frac{\sqrt{3}}{2}) = (\frac{1}{3}, \sqrt{3})$ $= (\frac{1}{3}, 1.73)$

So $y - \sqrt{3} = -\frac{\pi}{2}(x - \frac{1}{3})$

3. [3] (Chain Activity #3) Consider $\beta(x) = \dfrac{\sqrt{4x^3 - 5x + 2}}{\ln(x)}$. Indicate the steps you would use to find $\beta'(x)$ (e.g. product rule where f =this and g =that, or chain rule where f =this thing and g = that thing). You do *not* need to find $\beta'(x)$ but you do need to:

(a) indicate all the derivative rules you would use and ×2

(b) indicate the f and g used in each rule. ×1

Quotient Rule +.5

+.5 $f(x) =$ "high" $= \sqrt{4x^3 - 5x + 2}$

+.5 $g(x) =$ "low" $= \ln x$

then chain inside for +.5

+.5 $f(u) = \sqrt{u} = u^{\frac{1}{2}}$

+.5 $g(x) = 4x^3 - 5x + 2$

OR $\sqrt{4x^3 - 5x + 2} \cdot (\ln x)^{-1}$

Product +.5

$f(x) = \sqrt{4x^3 - 5x + 2}$ +.5

$g(x) = (\ln x)^{-1}$

then chain inside for +.5

$f(u) = \sqrt{u} = u^{\frac{1}{2}}$ +.5

$g(x) = 4x^3 - 5x + 2$

and chain inside for +.5

$f(u) = u^{-1}$ +.5

$g(x) = \ln x$