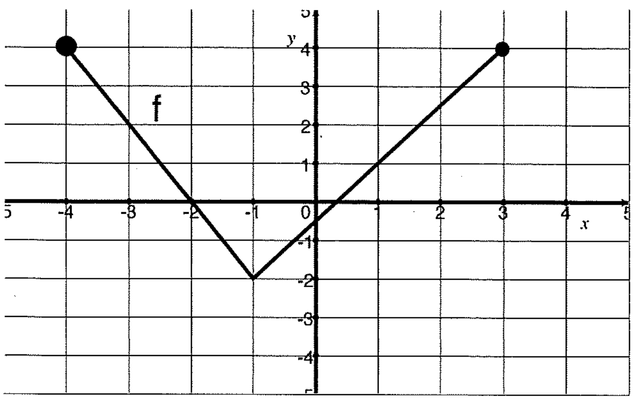
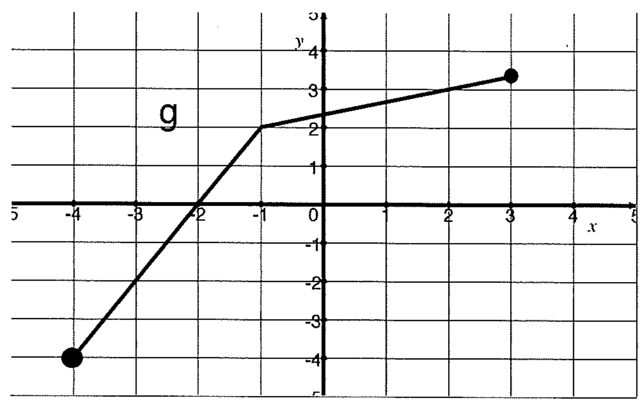
TMATH 124 UH: Quiz 3

Key

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

1. (ProductWks #1) Let f be the function graphed on the left and g be the function graphed on the right.





[1] (WebHW7 #4)
Find $\frac{d}{dx}(2e^x + g(x))|_{x=2}$

$2e^x + \frac{dg}{dx}\Big|_{x=2}$

$2e^2 + 1/3$

piece by piece (+.5)
get it (+.5)

[2] (ProductWks #1)
Estimate $\frac{d}{dx}(f \cdot g)|_{x=-2}$

product rule (+.5) plug in -2 (+.5)

$\left(\frac{d}{dx}f(x)\right)g(x) + f(x)\left(\frac{d}{dx}g(x)\right)\Big|_{x=-2}$

$\underbrace{-2 \cdot 0}_{(+.5)} + \underbrace{0 \cdot 2}_{(+.5)}$

0

[2] (WebHW8 #7)
Approximate $(f/g)'(-3)$

quotient rule (+.5) plug in -3 (+.5)

$$\frac{g(-3)f'(-3) - f(-3)g'(-3)}{(g(-3))^2}$$

$$\frac{(-2)(-2) - (2)(2)}{(-2)^2}$$

(+.5) (+.5)

$\frac{4-4}{4} = \frac{0}{4} = 0$

2. [2] (§3.2 #2) Let $f(x) = \dfrac{3x^4 - x^2 + \sqrt{x}}{x^2}$. Find $f'(x)$.

$$f(x) = \frac{3x^4}{x^2} - \frac{x^2}{x^2} + \frac{x^{1/2}}{x^2}$$
$$= 3x^2 - 1 + x^{-3/2}$$ (+1) or

$$f'(x) = 6x - 0 - \tfrac{-3}{2} x^{-5/2}$$
$$= 6x - \tfrac{3}{2} x^{-5/2}$$ (+1)

(simplifying first)

quotient rule (+.5)

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

(+.5) (+.5)

$$= \frac{x^2(12x^3 - 2x + \tfrac{1}{2}x^{-1/2}) - (3x^4 - x^2 + \sqrt{x})2x}{x^4}$$

got it (+.5)

3. [3] (§3.1 #54) Find the equation of the line tangent to $f(x) = x^{\frac{3}{2}}$ that is parallel to the line $y - 8 = 6(x + 5)$

(+.5) Looking for $y = mx + b$ or $y - y_1 = m(x - x_1)$

(+.5) m = slope of the line $y - 8 = 6(x+5)$
$= 6$

(+.5) need to find the point (x, y) so that
slope of the tangent to f @ x = slope of the line $y - 8 = 6(x+5)$

$$f'(x) = 6$$
(+.5) $$\tfrac{3}{2} x^{1/2} = 6$$

$$x^{1/2} = 4$$
$$x = 16$$ (+.5)

$$\begin{array}{r} 16 \\ 6 \\ \hline 96 \end{array}$$

So passes thru $(16, 16^{3/2})$ or $(16, 64)$ (+.5)

So $64 = 6(16) + b$
$64 = 96 + b$
$-32 = b$

So $y = 6x - 32$

or $y - 64 = 6(x - 16)$