EXAM 2 # TMath 124 Practice

Show *all* your work (numerically, algebraically, or geometrically) for the following problems. Supporting work is needed to earn credit.

1. Find both the following:

   $\lim_{x\to 0} \dfrac{\sin(4x)}{6x}$ $\qquad\qquad$ $\left(\dfrac{\sin(4x)}{6x}\right)'$

2. Sketch the graph of an example function f that satisfies the following conditions:

   (a) f is not differentiable when $x = -3$

   (b) f is continuous when $x = -3$

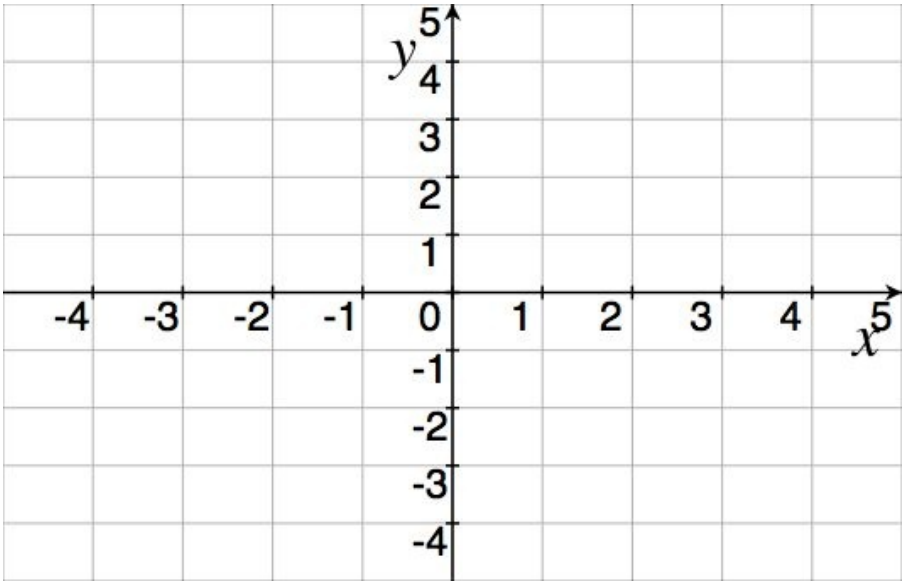
   (c) $f(1) = -4$

   (d) $\lim_{x\to 1} f(x) = 2$

   (e) $f'(3) = -\dfrac{1}{2}$

   (f) $\lim_{x\to -1^+} f(x) = 0$

   (g) $\lim_{x\to -1^-} f(x) = 1$

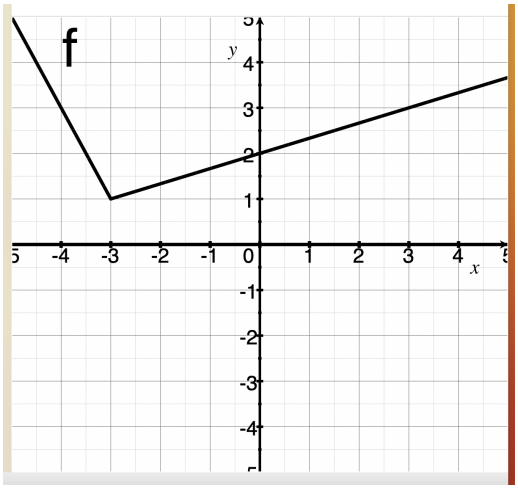


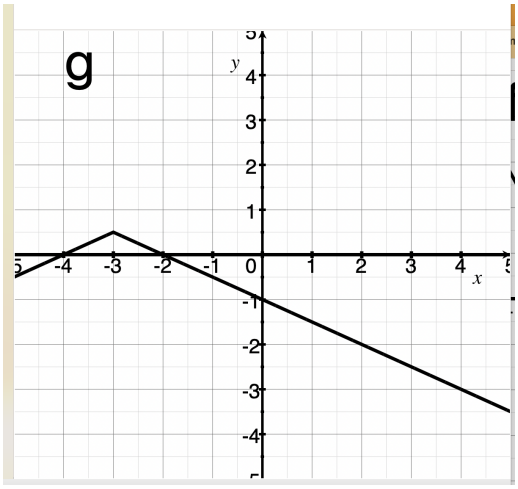
3. Find a formula for the function f you drew in problem (2).

4. Identify which derivative rule(s) you can use to find $\frac{dy}{dx}$. Do *not* find $\frac{dy}{dx}$!!

	Derivative Rule(s)
$y = \sqrt{\frac{x-1}{x^4+1}}$	
$y + x4^y = x^9$	
$y = e^{x^3-5x}$	
$y = (\tan(x))^x$	

5. Use the graphs of f and g below for the following questions.





(a) Find an x so that $g'(x)$ does not exist.

(b) Estimate $\dfrac{d}{dx}(f(x)g(x))|_{x=0}$

(c) If $c(x) = f(g(x))$, then estimate $c'(4)$.

(d) If $h(x) = g(3x - 1)$, then estimate $h'(2)$.

6. The differentiable functions f and g are defined for all real numbers. Values for f, f', g, and g' for various x values are given in the table.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	3	4	2	6
2	1	5	8	7
3	7	7	2	9

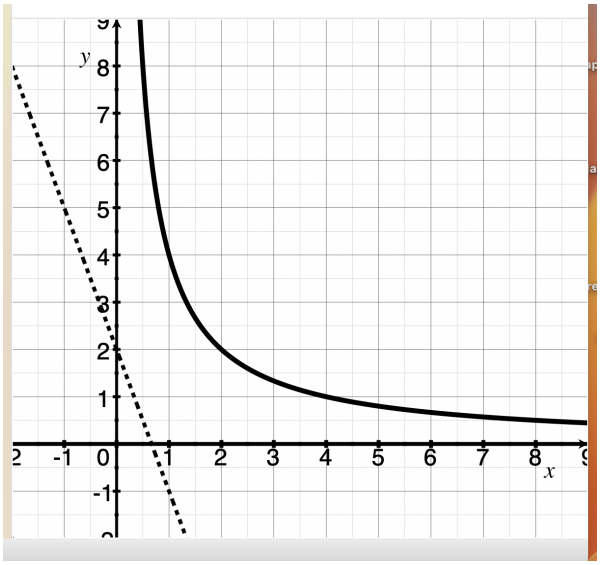
(a) Given that $h(x) = \frac{f(x)}{2x+g(x)}$, find $h'(1)$.

(b) Find the linearization of f at $x = 2$.

(c) Use the linearization of f to approximate $f(2.05)$.

7. A particle moves along a hyperbola $xy = 4$ when $x > 0$. The graph is shown below with a solid curve. The dotted line is of a dust particle moving along a straight line.

(a) Find the point that the particle's movement is parallel to a dust particle moving along the dotted straight line graphed.



(b) When the particle reaches an x value of 1, the y-coordinate is decreasing at a rate of 3 cm/s. How fast is the x-coordinate of the point changing at that instant?

8. Ryan and Stella were being chased by a pack of zombies. At point P they decided to split up and Stella ran south at 12 ft/s. Ryan waited for ten seconds to try to draw most of the zombies towards him and then started to run east at 15 ft/s. One minute later the two of them are still alive and running in their respective directions. At what rate are Ryan and Stella moving apart at this instant?