EXAM 1

TMath 124

Winter 2013

1. [6] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f be a function and x and y be positive numbers.

   T F $\sqrt{x+3} = (x+3)^{-2}$.

   T F If $\lim_{h\to 0}[f(h)] = 3$ and $\lim_{h\to o} g(h) = 0$, then $\lim_{h\to 0} \dfrac{f(h)}{g(h)}$ does not exist.

   T F If f is continuous and $\lim_{x\to -2} f(x) = 5.2$, then $f(-2) = 5.2$.

   T F If $f'(a)$ exists, then $\lim_{x\to a} f(x) = f(a)$.

   T F The parabola is the graph of a differentiable function.

   T F $\frac{d}{dx}(e^x) = xe^{x-1}$

Show your work for the following problems. The correct answer with no supporting work will receive NO credit (this includes multiple choice questions).

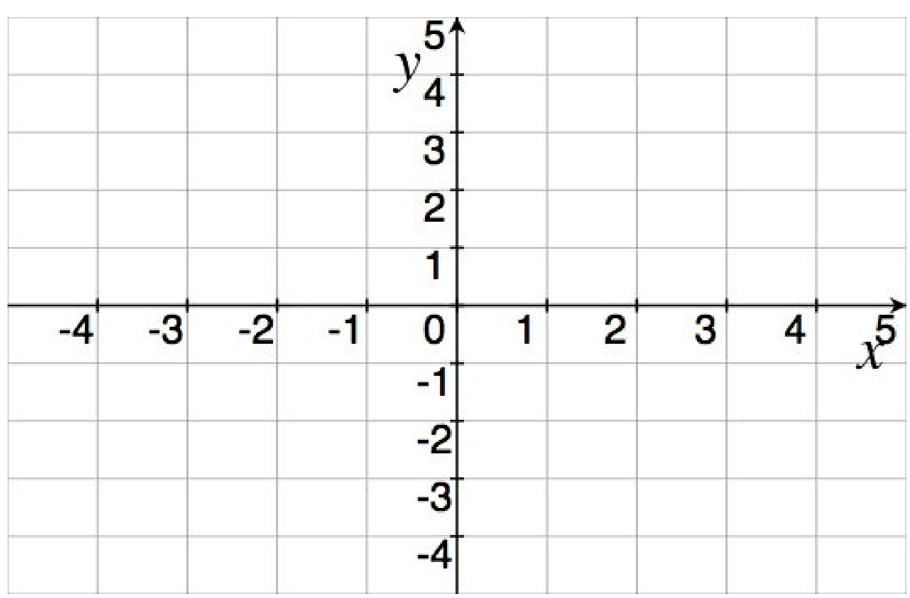
2. [4] (Quiz 2 #3) Sketch the graph of an example function f that satisfies the following conditions:

   (a) f is continuous everywhere but when $x = 3$

   (b) $\lim_{x\to 3^-} f(x) = \infty$

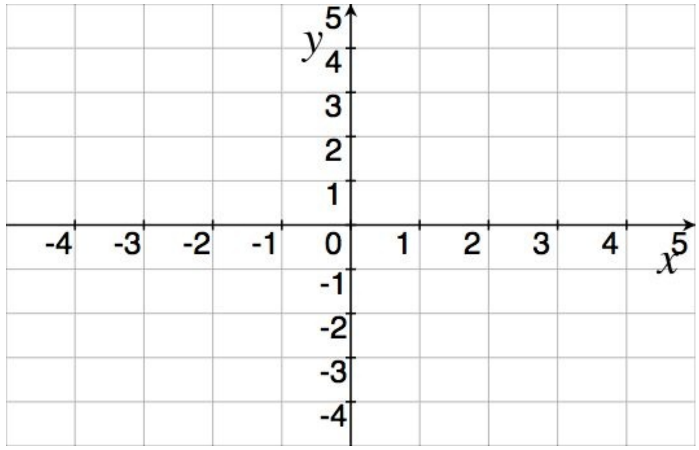
   (c) $f(-2) = 2$

   (d) $f'(-2) < 0$



3. Let

$$g(x) = \begin{cases} \frac{1}{2}x + 2 & \text{if } -4 < x < 0. \\ 3\sin\left(\frac{\pi}{2}x\right) & \text{if } 0 \le x \end{cases}$$



(a) [4] (Quiz1 #1) *Carefully* graph g below.

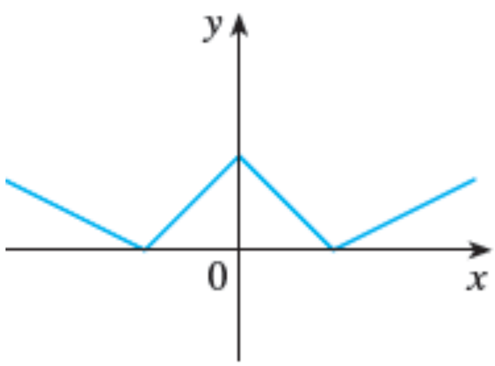
(b) [1] (§2.2 #5) Estimate $\lim_{x\to 0^-} g(x)$

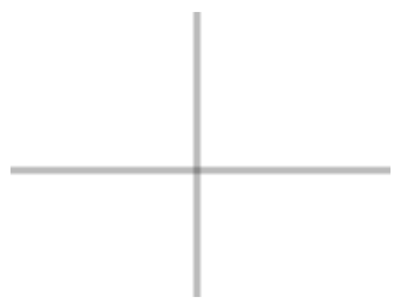
(c) [2] (§2.6 #4) Estimate $\lim_{x\to\infty} g(x)$

(d) [2] (WebHW5 #6) Estimate $g'(1)$

(e) [2] (§2.3 #2) Estimate $\lim_{x\to -2}[6g(x) - 3]$

4. [4] (WebHW6 #4) Consider the function m graphed on the left. Sketch m'.





5. [12] (§2.3 #3, WebW4 #10, limit laws wks #4, & PracticeExam #4) Find the limit or explain why it does not exist.

$$\lim_{x \to -1} (2x^2 - x + 1) \qquad\qquad \lim_{x \to \infty} \frac{17 - 7x^2}{8x^2 + 432x}$$

$$\lim_{h \to 0} \frac{(2+h)^2 - (2+h) - 2}{h} \qquad\qquad \lim_{x \to \infty} x^6 \sin x$$

6. [5] (poly & exp wks #4) Let $f(x) = x^2 - 3e^x$. Find the equation for the line tangent to the graph of f, when $x = 0$.

7. [3] (CalcWebHW5 #13) If the tangent line to $y = f(x)$ at $(4, 3)$ passes through the point $(0, 2)$ find the following.

   (a) $f(4)$

   (b) $f'(4)$

8. [5] Choose *ONE* of the following. Clearly identify which of the two you are answering and what work you want to be considered for credit.
   No, doing both questions will not earn you extra credit.

   (a) (§2.6 #63) Under certain assumptions the velocity $v(t)$ of a falling raindrop at time t is:
   $$v(t) = v^*(1 - e^{\frac{-gt}{v^*}})$$
   where g is the acceleration due to gravity (9.8 m/s^2).

      i. [3] Find $\lim_{t\to\infty} v(t)$.

      ii. [2] Interpret the answer given in (i) as a scientist and explain what v^* is in everyday language.

   (b) A rock thrown upwards on planet Mars with velocity $15\frac{\text{m}}{\text{s}}$ has a height $h(t) = 15t - 1.86t^2$ meters t seconds later.

      i. [2] (Story wks #6) Find the velocity of the rock after 2 seconds.

      ii. [3] (Story wks 6b) Use calculus to find *when* does the rock reach its maximum height?