MATH 1910: Calculus 1 Exam 1 Name:

1. Calculate the following limits (5 pts each):

   (a) $\lim_{x\to 0} \frac{\sin(4x)}{x}$. (Hint: $\lim_{x\to 0} \frac{\sin(x)}{x} = 1$)

   (b) $\lim_{x\to 3} \frac{x^2+2x+4}{x-1}$

   (c) $\lim_{h\to 0} \frac{\sqrt{1+h}-1}{h}$

   (d) $\lim_{x\to 3} \frac{x^2-9}{x-3}$

   (e) $\lim_{h\to 0} \frac{(x+h)^3-x^3}{h}$

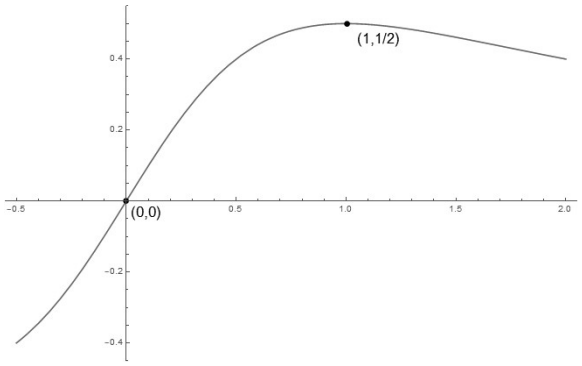
2. Calculate the following derivatives using the limit definition of derivative (5 pts each):

   (a) $\frac{d}{dx}\left(\frac{1}{\sqrt{x+1}}\right)$

   (b) $\frac{d}{dx}\left(\frac{x+2}{x+1}\right)$

   (c) $\frac{d}{dx}\left(2x^2\right)$

3. Find an equation for the tangent line to the function $f(x) = \frac{x}{x^2+1}$ at the points $(0,0)$ and $(1,1/2)$. Sketch the tangent line on the image below. (Tip: you may find it easier to find $f'(0)$ and $f'(1)$ by directly calculating those limits.) (20 pts)



4. Label f, f', f''. (20 pts)