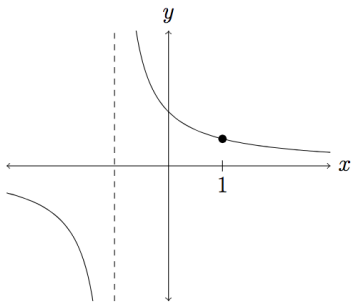
Calc β, BRIDGE 2018 **Name:** _____ **Due:** Wednesday, July 11

Homework #5: The derivative of a function

Note: Your work can only be assessed if it is legible. You must use the limit definition of the derivative. You do not need a calculator to complete this assignment.

1. Suppose $f(x)$ is a function such that $f(3) = 2$ and $f'(3) = 4$. Give an equation for the line tangent to the graph $y = f(x)$ at the point $(3, f(3))$.

2. The function $f(x) = \dfrac{1}{x+1}$ is graphed below. Find $f'(1)$ and use it to give an equation of the tangent line to $y = f(x)$ at $x = 1$.



3. Find the derivative $f'(x)$ for each of the following functions. Show your work.

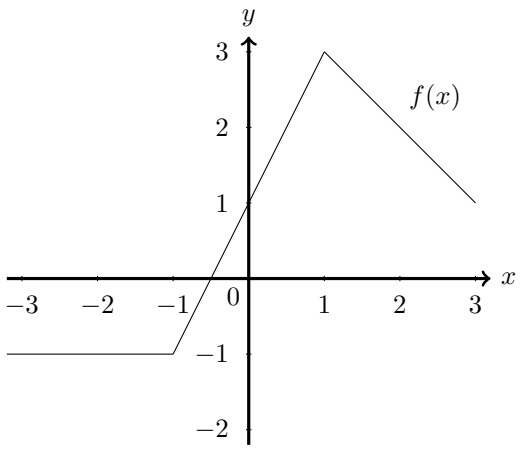
(a) $f(x) = 4x^2 + 1$

(b) $f(x) = \sqrt{2x}$

(c) $f(x) = \dfrac{1-x}{2+x}$

(d) $f(x) = mx + b$ where m and b are arbitrary constants.

4. The graph of $y = f(x)$ is pictured below.



(a) Compute each derivative below. If a derivative does not exist, write DNE.

i. $f'(-2)$

ii. $f'(1)$

iii. $f'(-1)$

iv. $f'(2)$

v. $f'(0)$

(b) Sketch a graph of the derivative $f'(x)$ for $-3 \leqslant x \leqslant 3$.

5. In class we mentioned that if a function is differentiable at $x = a$ then it is also continuous there. With that in mind, consider the following statements.

   (a) T/F (with justification) A function that is continuous at a is also differentiable at a.

   (b) T/F (with justification) If $f'(2)$ exists, then $\lim_{x \to 2} f(x) = f(2)$.

6. **Bonus:** Give the name of a function which is continuous at every point but is differentiable at no point.
   Hint: Use Google.