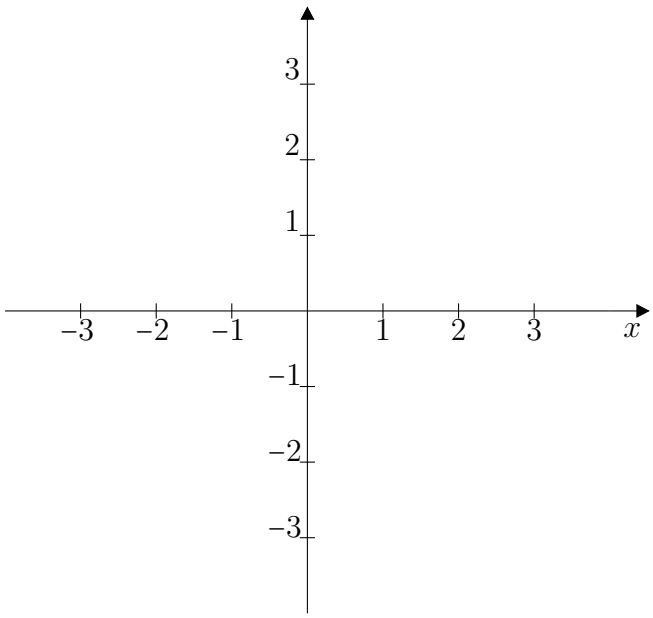
Math 1550 Section 20
Practice Test 1

1. Sketch a function $f(x)$ with the following properties:

   - $\lim_{x \to -3} f(x) = 1$, but $f(x)$ is not continuous at $x = -3$.
   - $\lim_{x \to -1} f(x) = \infty$.
   - $\lim_{x \to 0^-} f(x) = 1$, but $\lim_{x \to 0^+} f(x) = 0$
   - $f(x)$ is continuous but non-differentiable at $x = 1$.
   - $\lim_{x \to 3} f(x)$ does not exist.



2. Let $f(x) = \dfrac{x^2 - x - 2}{(x-2)(x+1)}$.

a) Find $\lim_{x \to -1} f(x)$, or state that the limit does not exist.

b) Find $\lim_{x \to 2} f(x)$, or state that the limit does not exist.

3. Use the squeeze theorem to show that $\lim_{x \to 0} \dfrac{\sin x}{x} = 1$.

4. Use the definition of the derivative of $f(x)$ to find $\dfrac{d}{dx} x^2$. (Don't just write the answer!)

5. Let $f(x) = (x-1)^3$. Find $f'(x)$ and $f'(1)$.

6. Find the equation of the tangent line to $f(x) = \sqrt{x}$ at the point $(64, 8)$.

7. Let $f(x) = x^2 e^x$. Find $f'(1)$.

8. Let $f(x) = \sqrt{x}$. For $\varepsilon = \frac{1}{10}$, find $\delta > 0$ such that $|f(x) - 3| < \varepsilon$ whenever $|x - 9| < \delta$.