TEST 1          MATH 200, SECTION 1
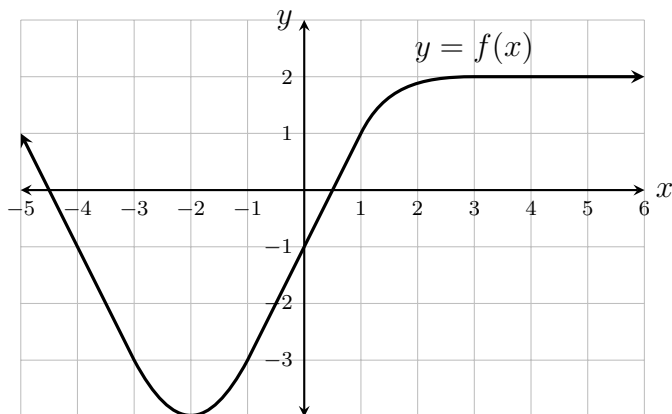
Name: _____          March 12, 2021

**Directions:** Closed book, closed notes, no calculators.     Put phones, etc., away.     You will need only a pencil or pen.

1. (10 points) Use a **limit definition** of the derivative to find the derivative of $f(x) = \sqrt{x+1}$.

2. (12 points) The graph of a function $f(x)$ is sketched below.

    (a) Using the same coordinate axis, sketch a graph of the derivative $f'(x)$.

    (b) Suppose $g(x) = \dfrac{1}{f(x)}$. Find $g'(0)$.

3. (48 points) Find the derivatives of these functions. You do **not** need to simplify your answers.

(a) $f(x) = 5x^7 + 3x - \sqrt{2}$

(b) $f(x) = \sin(x) + \sec(x)$

(c) $f(x) = \sin(x)\sec(x)$

(d) $f(x) = \sin\big(\sec(x)\big)$

(e) $f(x) = \sec\big(\sin(x)\big)$

(f) $f(x) = \dfrac{\tan(x)}{x^2 + e^x}$

(g) $f(x) = \sqrt{e^x + x}$

(h) $y = \cos\left(e^{x^2 + x}\right)$

4. (10 points) Given that $z = w\cos(w)$, find $\dfrac{d^2z}{dw^2}$.

5. (10 points) Find the equation of the tangent line to the graph of $f(x) = e^{-x}$ at $\big(0, f(0)\big)$.

6. (10 points) Find all $x$ for which the tangent to the graph of $f(x) = e^x - 2x$ at $\big(x, f(x)\big)$ is horizontal.