1. The graph of a function $f$ is given in each part below. On the same axes, sketch the graph of $f'$.
2. Let $f(x) = (2x + 1)^{-1}$.

(a) Using the definition of the derivative as a limit, compute $f'(x)$.

(b) Find the equation for the tangent line at $x = 2$.

(c) Graph $f(x)$ and the tangent line.
3. Compute the following limits and simplify the results.

(a) \( \lim_{x \to \infty} \frac{\pi}{x} = \)

(b) \( \lim_{x \to \infty} \cos(\pi/x) = \)

(c) \( \lim_{x \to \infty} \sin \left( \frac{\pi}{6 \cos(\pi/x)} \right) = \)

(d) \( \lim_{x \to \infty} \log_2 \left( \sin \left( \frac{\pi}{6 \cos(\pi/x)} \right) \right) = \)

4. State

- the definition of “Continuous” and
- the definition of “Differentiable”.

Give an example of a function that is one but not the other.
5. Compute the following derivatives:

(a) \( f(x) = 2 + x - x^2 + \frac{3}{x} - \sqrt{x} - 5x^7 + x^{3/4} + 3\sin(x) + \cot(x) - \sin(7) \)

\[ f'(x) = \]

(b) \( D_x \left[ \cos(x)(8\cos(x) + x^5 + 3x) \right] = \)

(c) \( y = \frac{x^3 - 5x}{\sin(x) + x} \Rightarrow \frac{dy}{dx} = \)
Total