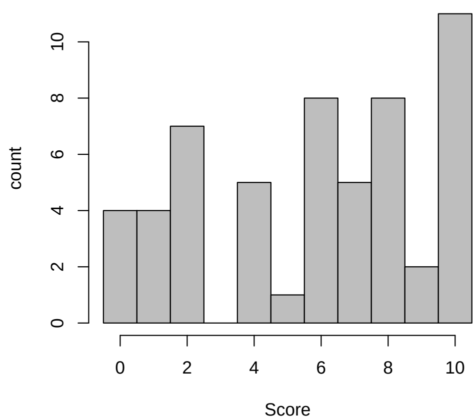
score	possible	page
	20	1
	30	2
	25	3
	25	4
	100	

Name: ______________________________

Show your work!
You may not give or receive any assistance during a test, including but not limited to using notes, phones, calculators, computers, or another student's solutions. (You may ask me questions.)

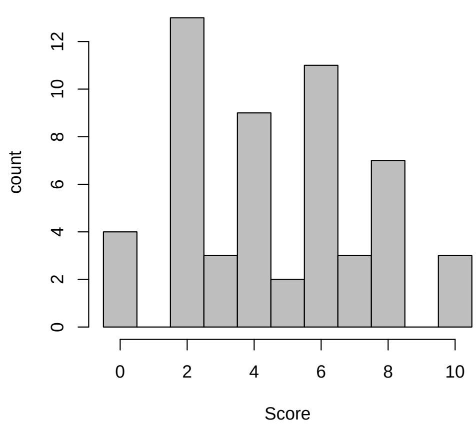
/10 1. For the function $f(x) = (2x+1)^{-1}$, the tangent line at $x = 2$ has equation $y = (-2/25)(x-2) + 1/5$. Graph $f(x)$ and the tangent line.



/10 2. State

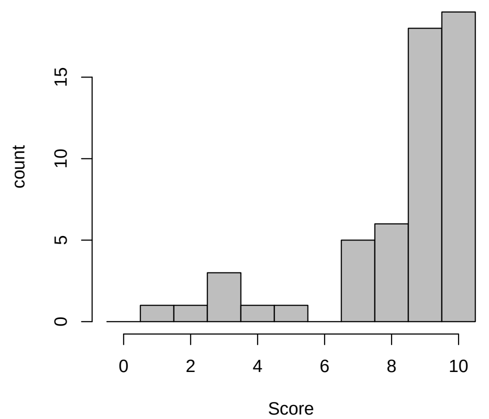
- the definition of "Continuous" and
- the definition of "Differentiable".

Give an example of a function that is one but not the other.

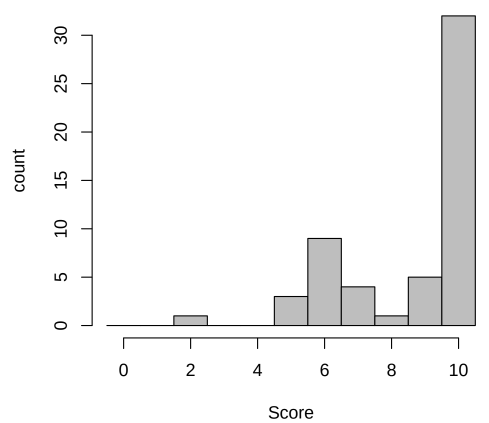


3. Compute the following derivatives:

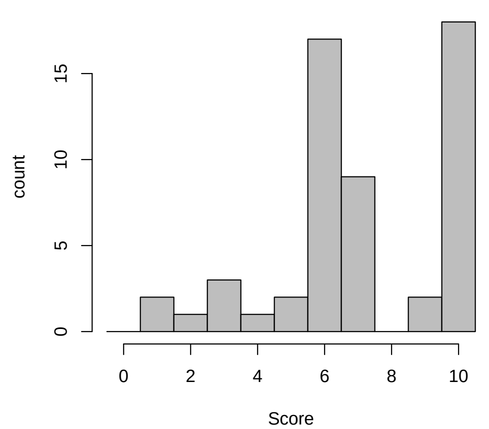
/10 (a) $f(x) = \sqrt{x^2 + \dfrac{3}{x} + x^{3/4} + \cot(x) - \sin(7)}$
$\Rightarrow f'(x) =$



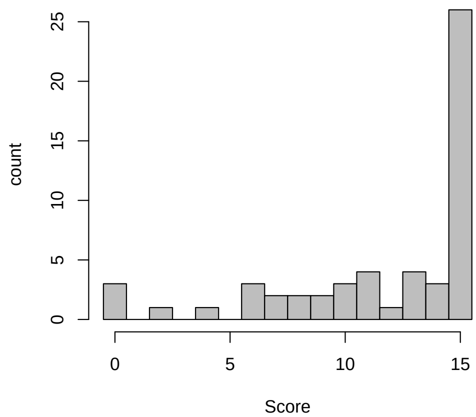
/10 (b) $D_x\left[\cos(x)\sin(8 + x^5 + 3x)\right] =$



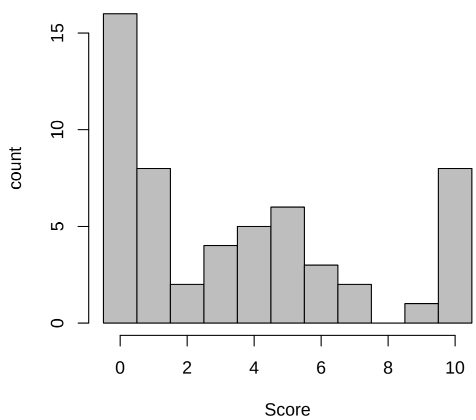
/10 (c) $y = \tan^5\left(6x^3 - 7x\right) \Rightarrow \dfrac{dy}{dx} =$



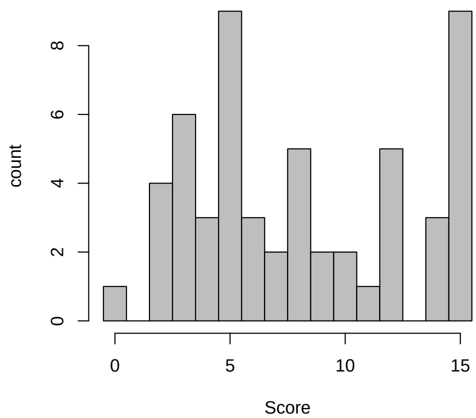
/15 4. Use implicit differentiation to find an equation for the tangent line to the curve defined by $y^3 + x^2y^4 = 1 + 2x$ at the point $(0, 1)$.



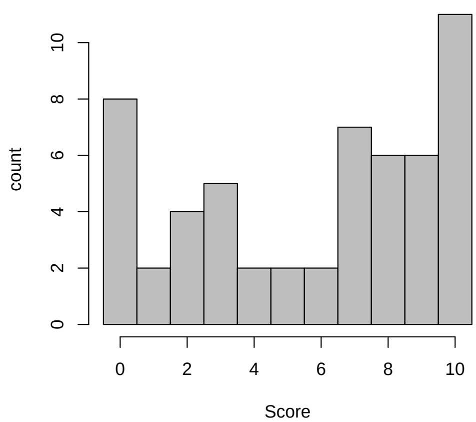
/10 5. State the Intermediate Value Theorem. Identify what are its assumptions (hypotheses) and what are its conclusions.



/15 6. A trough is 10m long and its ends have the shape of isosceles triangles that are 3m across at the top and have a height of 1m. The trough is being filled with water at a rate of $12\text{m}^3/\text{min}$. Draw and label a diagram illustrating this scenario. How fast is the water level rising when it is 0.5m deep?



/10 7. Use a linear approximation (or differentials) to estimate $(8.03)^{2/3}$.



Total