score	possible	page
	20	1
	30	2
	30	3
	20	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.)

1. Sketch the graph of a single function that has all of the following properties:

/2 (a) Continuous everywhere.

/2 (b) $f'(x) > 0$ if $|x| < 2$.

/4 (c) $f'(x) < 0$ if $|x| > 2$.

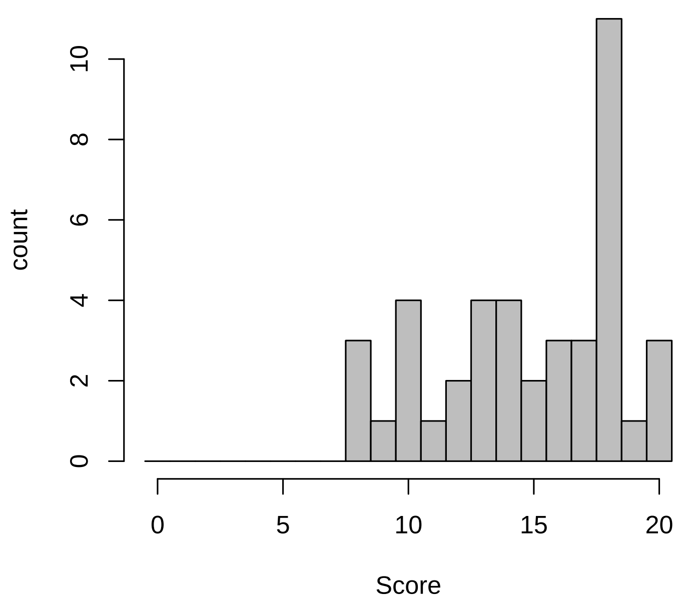
/2 (d) $f'(-2) = 0$.

/2 (e) f is not differentiable at $x = 2$.

/2 (f) $\lim_{x\to 2} |f'(x)| = \infty$.

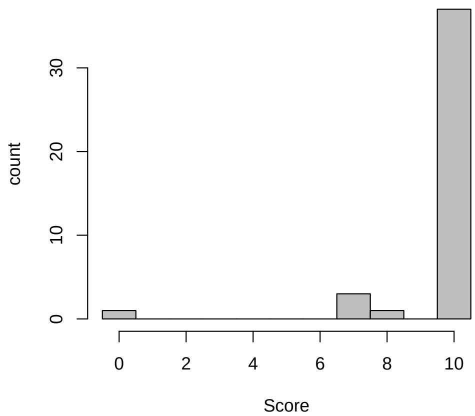
/4 (g) $f''(x) > 0$ if $x \neq 2$.

/2 (h) $f(2) = 3$.

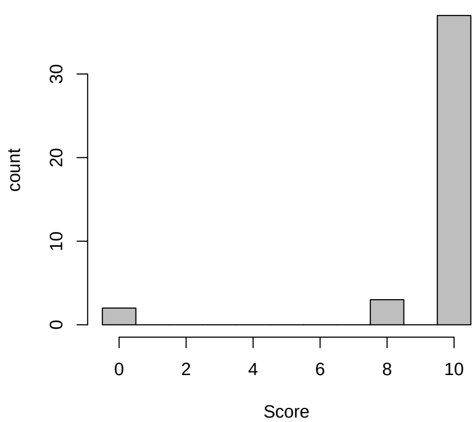


2. Let $f(x) = 2x^3 - 3x^2 - 12x + 3$

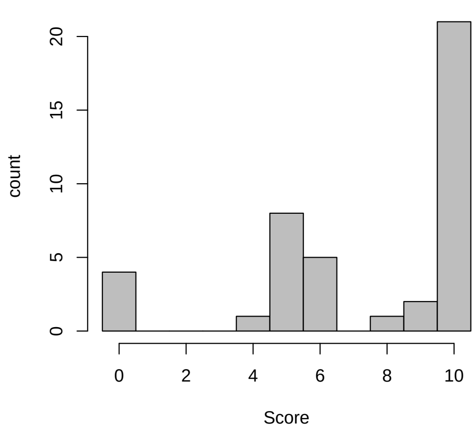
/10 (a) Find the intervals where f is increasing, and the intervals where it is decreasing.



/10 (b) Find the intervals where f is concave up, and the intervals where it is concave down.



/10 (c) Find the absolute maximum and minimum values of f on the interval $[-2, 0]$.



3. For the function
$$f(x) = \frac{x}{x^2 - 9}$$

/2 (a) Find the x- and y-intercepts.

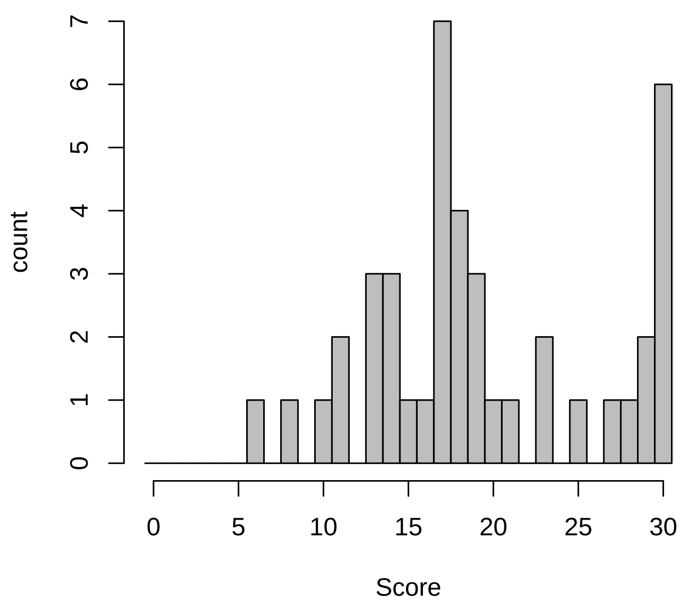
/4 (b) Find any asymptotes.

/6 (c) Find the intervals on which f is increasing or decreasing.

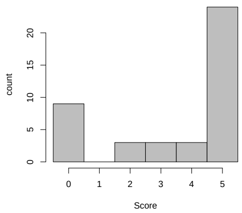
/2 (d) Find the local maximum and minimum values of f.

/6 (e) Find the intervals of concavity and the inflection points.

/10 (f) Use the information above to sketch the graph.



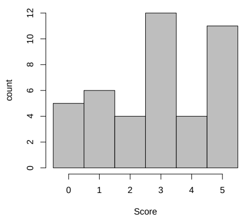
/5 4. (a) State the Mean Value Theorem (MVT).



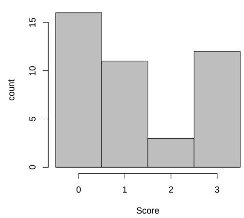
/5 (b) State why the function

$$f(x) = x^3 - 3x + 2 \quad \text{on the interval} \quad [-2, 2]$$

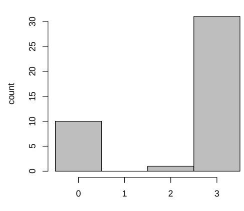
satisfies each of the hypotheses of the MVT on the given interval. Then find all numbers c that satisfy the conclusion of the MVT.



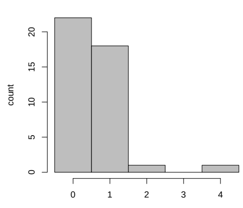
5. Compute the following:



/3 (a) $\dfrac{d}{dx}\left[x^x\right] =$



/3 (b) $\displaystyle\lim_{x\to\infty} x^x =$



/4 (c) $\displaystyle\lim_{x\to 0^+} x^x =$

Total