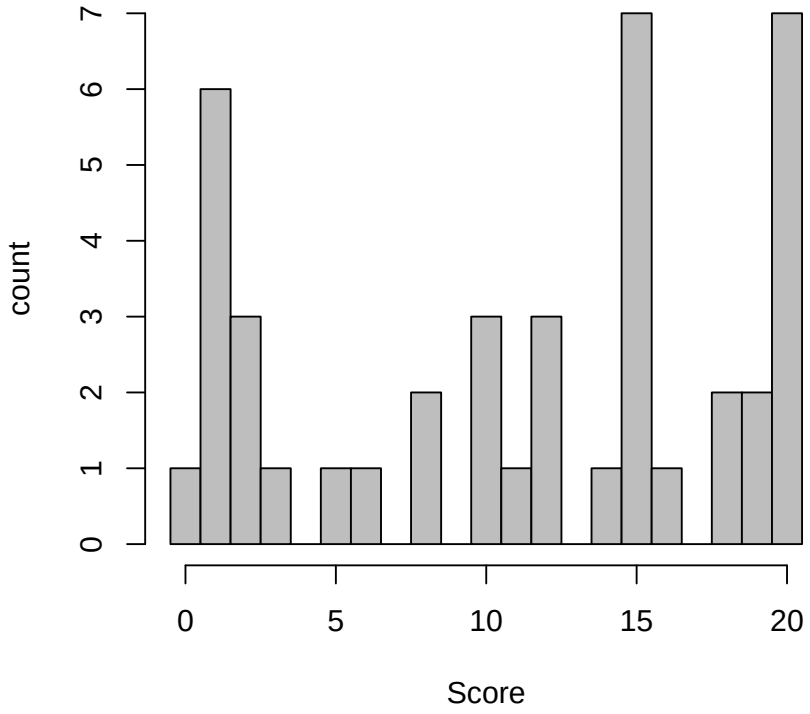
score	possible	page
	20	1
	30	2
	20	3
	30	4
	100	

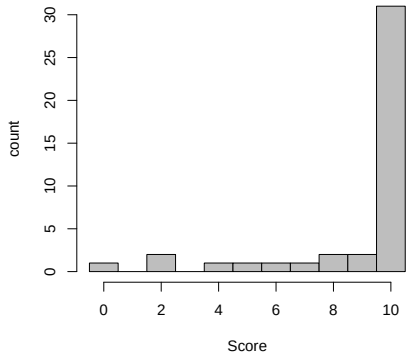
Name: _____

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.)

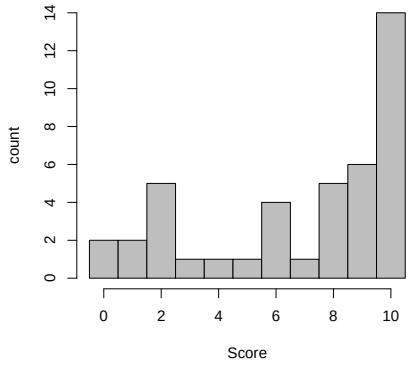
/20 1. A Norman window has the shape of a rectangle surmounted by a semicircle. (Thus the diameter of the semicircle is equal to the width of the rectangle.) If the perimeter of the window is 30ft, find the dimensions of the window so that the greatest possible amount of light is admitted.



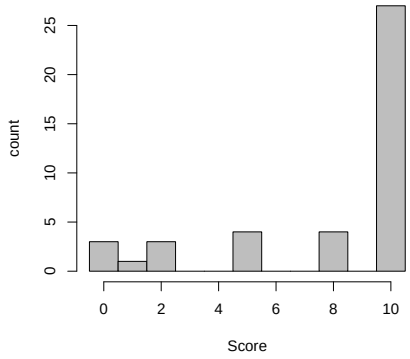
/10 2. Use Newton's method with the initial approximation $x_1 = 1$ to find x_2, the second approximation to the root of the equation $x^5 - x + 1 = 0$. Leave the answer as a fraction.



/10 3. Find $f(x)$ if $f''(x) = x^{-2}$ for $x > 0$, $f(1) = 0$, and $f(2) = 0$.



/10 4. Estimate the area under the graph of $f(x) = \sqrt{x}$ from $x = 0$ to $x = 4$ using four approximating intervals and midpoints.



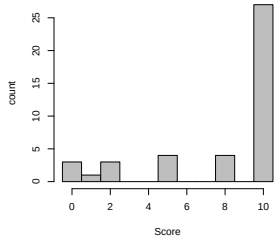
/10 5. Compute the following limits and simplify the results.

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

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

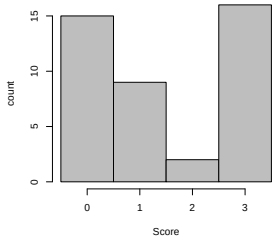
(c) $\lim_{x\to\infty} \sin\left(\dfrac{\pi}{6\cos(\pi/x)}\right) =$

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

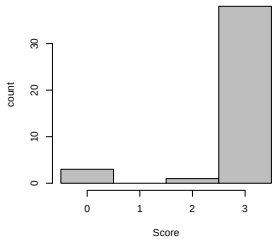


6. Compute the following:

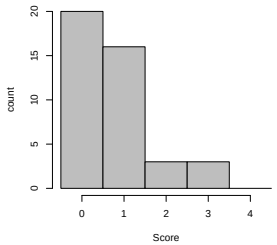
/3 (a) $\dfrac{d}{dx}[x^x] =$



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



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



7. For the function

$$f(x) = \frac{x}{x^2 - 9}$$

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

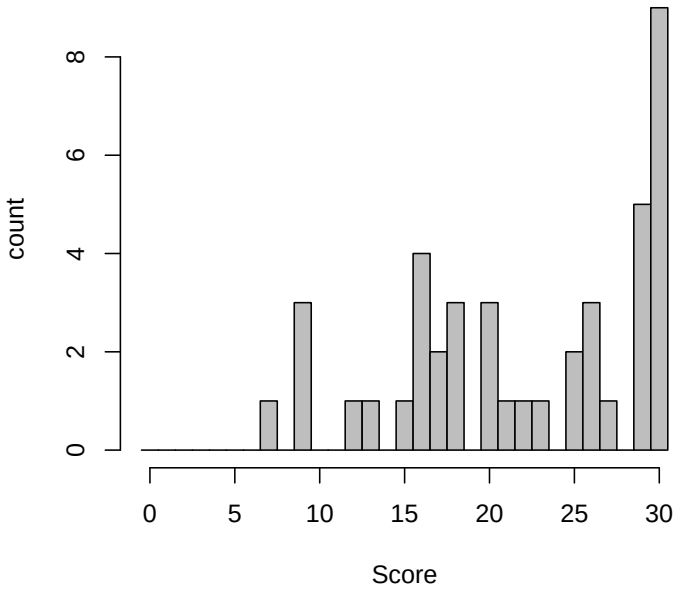
/4 (b) Find any asymptotes.

/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.



Total