

score	possible	page
	30	1
	30	2
	20	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. Compute the following derivatives.

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

/3 (b) $\frac{d}{dx} [3^x] =$

/3 (c) $\frac{d}{dx} [3^3] =$

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

/3 (e) $\frac{d}{dx} [x^{1/3}] =$

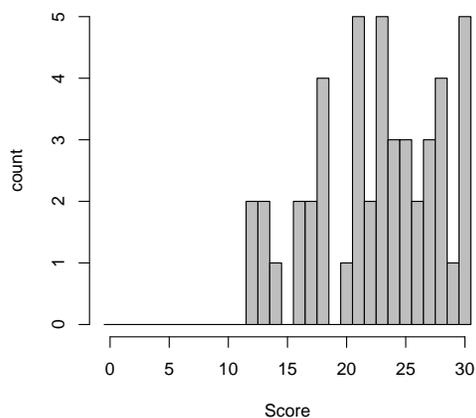
/3 (f) $\frac{d}{dx} [x^{-3}] =$

/3 (g) $\frac{d}{dx} [\log_3(x)] =$

/3 (h) $\frac{d}{dx} [\tan(x)] =$

/3 (i) $\frac{d}{dx} [\arctan(x)] =$

/3 (j) $\frac{d}{dx} [\tanh(x)] =$



2. Compute the following limits. If you use the Squeeze theorem or L'Hôpital's rule, then say so.

/3 (a) $\lim_{x \rightarrow 0^+} e^x =$

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

/3 (c) $\lim_{x \rightarrow 0^+} \ln(x) =$

/3 (d) $\lim_{x \rightarrow \infty} \ln(x) =$

/3 (e) $\lim_{x \rightarrow 0^+} \frac{2}{x} \sin(3x) =$

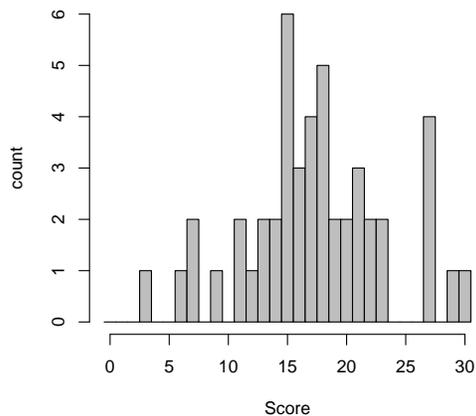
/3 (f) $\lim_{x \rightarrow \infty} \frac{2}{x} \sin(3x) =$

/3 (g) $\lim_{x \rightarrow 0^+} \frac{2}{x} e^{3x} =$

/3 (h) $\lim_{x \rightarrow \infty} \frac{2}{x} e^{3x} =$

/3 (i) $\lim_{x \rightarrow -1^+} \sin^{-1}(x) =$

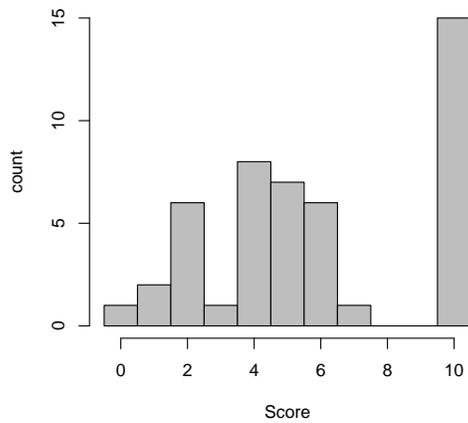
/3 (j) $\lim_{x \rightarrow \infty} \sinh(x) =$



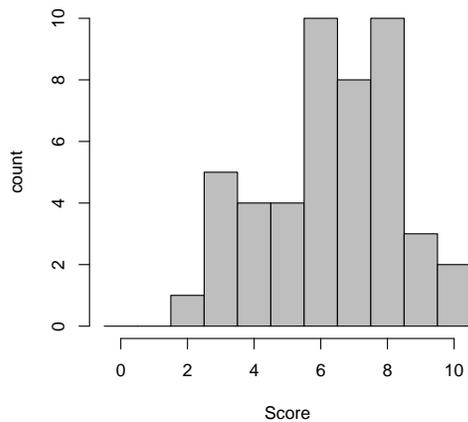
/10 3. If an electrostatic field E acts on a liquid polar dielectric, the net dipole moment P per unit volume is

$$P(E) = \frac{\cosh(E)}{\sinh(E)} - \frac{1}{E}.$$

Show that $\lim_{E \rightarrow 0^+} P(E) = 0$.



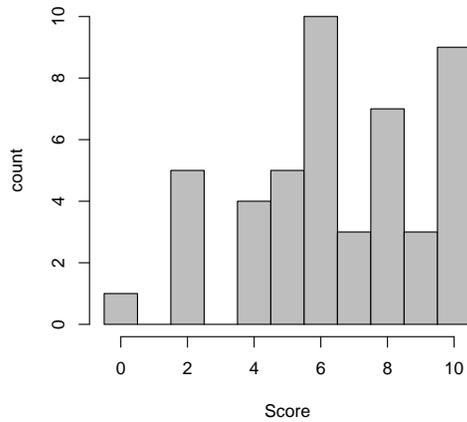
/10 4. A ladder 10 ft long is leaning against a vertical wall. It starts slipping, such that the bottom of the ladder slides away from the base of the wall at a speed of 2ft/s. Draw and label a diagram illustrating this scenario. How fast is the angle between the ladder and the wall changing when the bottom of the ladder is 6 ft from the base of the wall?



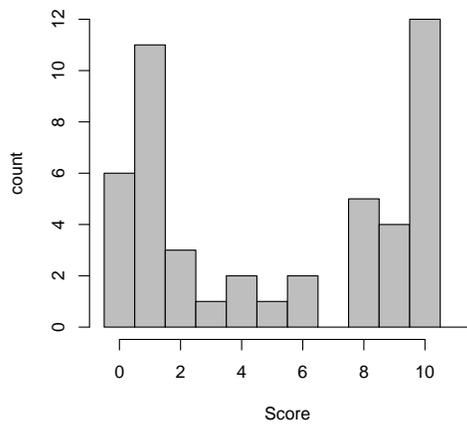
/10 5. State

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

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



/10 6. Use a linear approximation (or differentials) to estimate $(8.03)^{2/3}$.



Total

