

Math135 Engineering Calculus I

Second Midterm Exam

Colorado Mesa University 2024 Fall

NAME: _____

1. What's a formula for this derivative?

$$\frac{d}{dx} \left(x^{27} + \sqrt[27]{x} + \frac{1}{x^{27}} + 27^2 \right)$$

2. What's a formula for this derivative?

$$\frac{d}{dx} \left(27 \sin(x) + \csc(27x) + 27x \right)$$

3. What's a formula for this derivative? Express the formula concisely.

$$\frac{d}{dx} \left(\frac{x}{27+x} \right)$$

4. What's a formula for this derivative? Express the formula concisely.

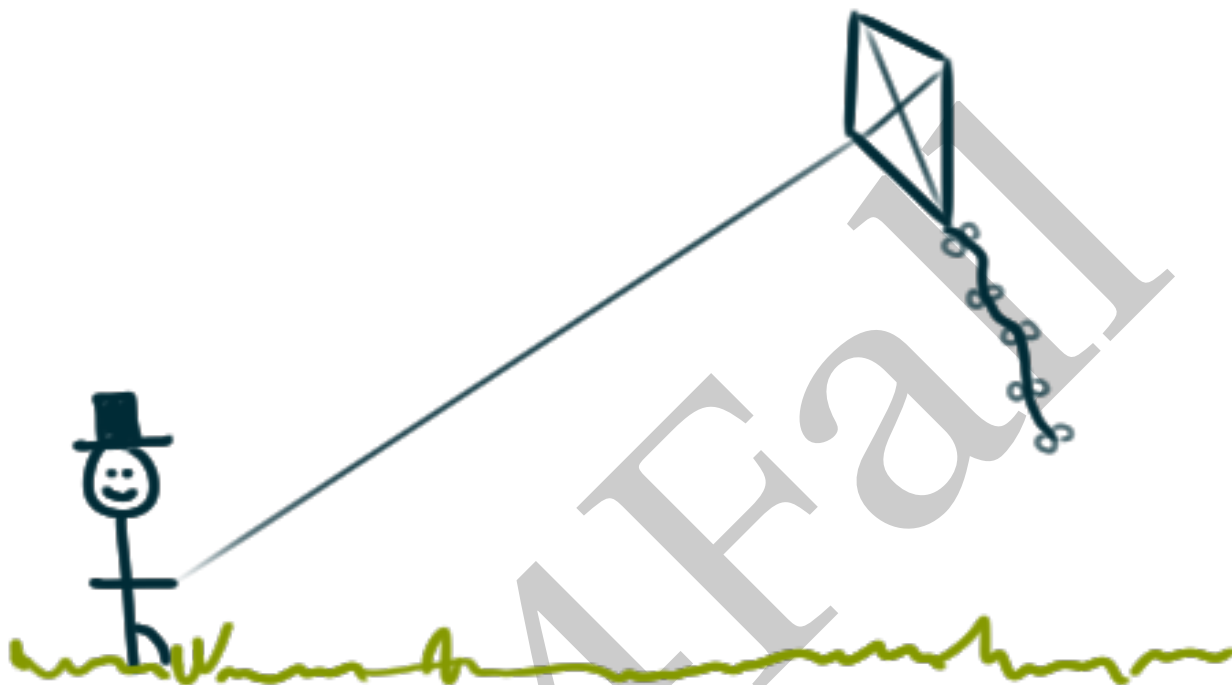
$$\frac{d}{dx} \left(\sqrt[3]{27x^3} \tan(27x) \right)$$

5. For the following definition of a function g , what is the value of $g(27)$?

$$g(x) = \lim_{h \rightarrow 0} \frac{\sqrt[3]{x+h} - \sqrt[3]{x}}{h}$$

6. Write down an equation for the line tangent to the curve $\sqrt{3}\sec(xy) = 2$ at the point where $x = 1$ and $y = \frac{\pi}{6}$. Write the equation in the form $y = mx + b$.

7. You are flying a kite at a constant altitude of 115 ft. You begin rapidly letting out kite-string at a rate of 36 ft/s as the wind carries the kite horizontally away from you. What is the instantaneous velocity of the kite at the moment you've let out 277 ft of kite string?



8. You are about to bake a pizza that you plan to eat throughout the week, and are contemplating how big you should make it. You are on a diet, and have decided to limit yourself to eating only one slice of pizza per day. However you realize that this doesn't really limit you; you could cut the slice as big as you want! So to keep your diet sincere, you decide to only cut slices of pizza that have a perimeter of exactly 27".

Use calculus to demonstrate how to determine the diameter of pizza that will reward you with the largest slice.

