

## Mu A Individual

1. Differentiate  $x^{x^2}$ .

$$2x^x$$

$$\ln y = x^2 \ln x$$

$$\frac{y'}{y} = 2x \ln x + \frac{x^2}{x}$$

2. Roy is a slime rancher, and he's just discovered a new slime: the Rad Slime! The rate at which a Rad Slime's radioactive radius increases is 2 inches every hour when fully agitated. Assuming that the Rad Slime's aura is perfectly spherical and that the initial radius is 1 inch, at what rate is the volume of the agitated Rad Slime's aura increasing by in  $\text{in.}^3/\text{hour}$  after 4 hours?

$$r' = 2$$

$$V = \frac{4}{3} \pi r^3$$

$$V' = \frac{4}{3} \pi 3r^2 r'$$

$$\frac{4}{3} \pi$$

$$4 \pi r^2 r'$$

$$4 \pi 9^2 2$$

$$648 \pi$$

3. If  $f(3) = 20$  and  $f'(3) = 13$ , what is the value of the derivative of  $f^{-1}(20)$ ?

$$\frac{1}{13}$$

$$\frac{1}{f'(f^{-1}(20))}$$

4. Find  $\lim_{\odot \rightarrow 0} \frac{(2+\odot)^6 - 2^6}{\odot}$ , or state if it does not exist. (This is cringe!)

$$(x)^6$$

$$6x^5$$

5. Find  $\frac{dy}{dx} \big|_{x=2} x^4 + 2x^3 - 6$ .

$$4x^3 + 6x^2$$

$$32 + 24$$

$$8$$

6. Generate a point-slope form equation of a tangent line to the function  $\frac{60}{x^2}$  at  $x = 5$ .

$$60 \left( -\frac{2}{x^3} \right)$$

7. The position of a particle at time  $t$  is modeled by  $s(t) = t^3 + 12 \ln(t)$ . What is its velocity function?

8. If  $r(x)$  and  $g(x)$  are functions, what is the derivative of  $r(gr)$ ?

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x# 33

9. Does the Mean Value Theorem apply to  $f(x) = \frac{1}{3x-99}$  on  $[15, 35]$ ? If so, for what values?

No

$$\frac{45}{99}$$

$$\frac{35}{105}$$

$$\frac{1}{6} + \frac{1}{54} =$$

10. Differentiate  $\sin^{-1}(x^2 - 9x + 81)$ .

$$\frac{2x - 9}{\sqrt{1 - (x^2 - 9x + 81)^2}}$$

11. If  $z(x) = \tan^{-1}(x)$ , what is  $z''(x)$ ?

$$\frac{1}{1 + x^2}$$

$$(1+x^2)^{-1}$$

$$-2(1+x^2)^{-2} (2x)$$

12. Is the function  $f(x) = \frac{4x+5}{9-3x}$  continuous at  $x = -1$ ?

Yes

13. Find  $\lim_{x \rightarrow 0} \left( \frac{\sin(3x)}{x} - 3 \right)$ .

$$3 - 3$$

14. Find the equation of the line tangent to  $y^2 e^{2x} = 3y + x^2$  at  $(0, 3)$ .

$$2yy'e^{2x} + 2e^{2x}y^2 = 3y' + 2x$$

$$+ 18 = 2(9)$$

15. Find the linear approximation of the function  $f(x) = \sqrt{1-x}$  about 0 to approximate  $\sqrt{0.9}$

$$f(0.1) = \sqrt{1-0.1} = \sqrt{0.9}$$

$$(1-x)^{\frac{1}{2}}$$

$$-\frac{1}{2}(1-x)^{-\frac{1}{2}}$$

$$y = -\frac{1}{2}x + 1$$