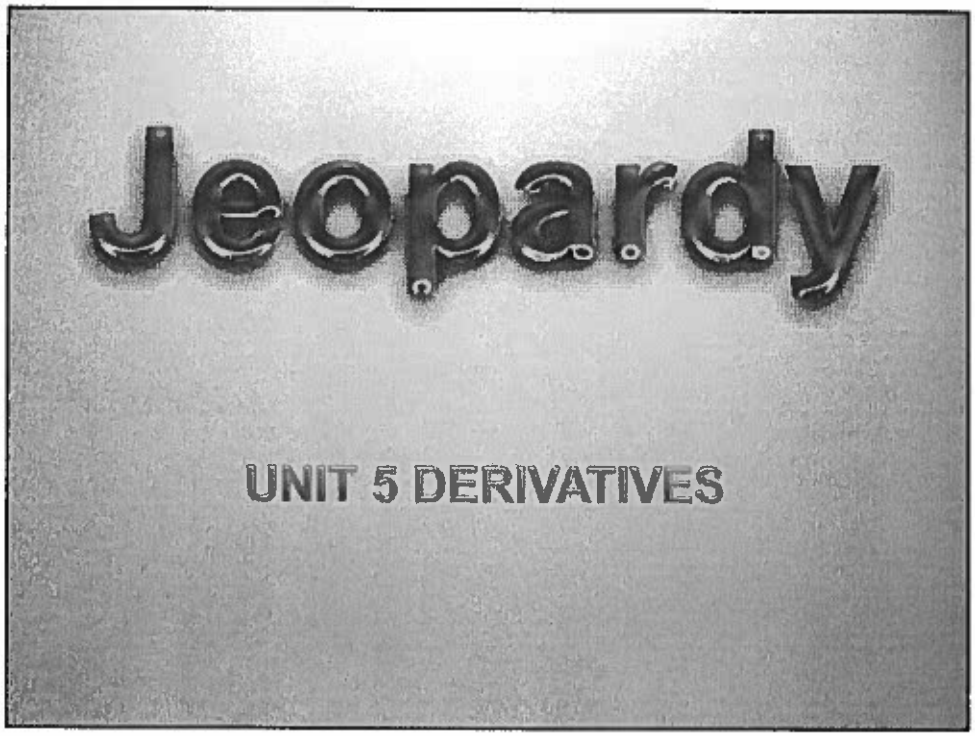


UNIT 5 JEOPARDY

Miscellaneous	Power Rule	Limit Definition	Applications	Tangent Lines
10	10	10	10	10
20	20	20	20	20
30	30	30	30	30
40	40	40	40	40
50	50	50	50	50

Category 1 – 10 Points

What is the limit definition of a derivative?

$$\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

Category 1 – 20 Points

What is the quotient rule?

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right]=\frac{g(x)f'(x)-f(x)g'(x)}{\left[g(x)\right]^2},\ g(x)\neq 0$$

Category 1 – 30 Points

- Find f'(x) if $f(x) = \dfrac{2x-1}{4x+3}$

$$= \frac{(4x+3)(2)-(2x-1)(4)}{(4x+3)^2} \qquad g\cdot f' - f\cdot g' \text{ over } g^2$$

$$= \frac{10}{(4x+3)^2}$$

Category 1 – 40 Points

Let $f(x) = (2x + 3)(x^3 + 4)^2$. Find f'(x)

$$= (2x+3)(2(x^3+4)(3x^2)) + (x^3+4)^2(2) \qquad f\cdot g' + g\cdot f'$$

chain rule of g

$$f'(x) = (2x+3)(6x^2(x^3+4)) + (x^3+4)^2(2)$$

$$= (2x+3)(6x^5+24x^2) + (x^3+4)^2(2)$$

$$= (2x+3)(6x^5+24x^2) + 2(x^3+4)^2$$

Update Answer

Category 1 – 50 Points

- Find f'(x) given that

$$f(x) = \frac{2}{\sqrt[3]{x^2+4}} = 2(x^2+4)^{-1/3} = h(x)$$

$h(x)$

$$f'(x) = \frac{-4x}{3(x^2+4)^{4/3}}$$

$f(x) = 2x^{-1/3}$

$f'(x) = -\frac{2}{3}x^{-4/3}$

$g(x) = x^2+4$

$g'(x) = 2x$

$h'(x) = -\frac{2}{3}(x^2+4)^{-4/3} \cdot 2x$

Category 2 – 10 Points

Find the derivative of

$$f(x) = \sqrt[3]{x}.$$

$$f(x) = x^{1/3}$$

$$f'(x) = \frac{1}{3}x^{-2/3} = \frac{1}{3\sqrt[3]{x^2}}$$

Category 2 – 20 Points

Find the derivative of

$$f(x) = 4x^3 + 6\sqrt{x} - 6x^{\frac{7}{6}}$$

$$f'(x) = 12x^2 + \frac{3}{\sqrt{x}} - 7x^{\frac{1}{6}}$$

Category 2 – 30 Points

Find the derivative of

$$f(x) = 5v^3 - \sqrt[4]{v}$$

$5v^3 - v^{1/4}$

$f'(x) = 15v^2 - \frac{1}{4}v^{-3/4}$

$$f'(x) = 15v^2 - \frac{1}{4v^{3/4}}$$

$$f'(x) = 15v^2 - \frac{1}{4\sqrt[4]{v^3}}$$

Category 2 – 40 Points
Find the derivative of

$$p(t) = 12t^4 - 6\sqrt{t} - \frac{5}{t}$$

$$p'(t) = 48t^3 - 3t^{-\frac{1}{2}} + 5t^{-2}$$

$$p'(t) = 48t^3 - \frac{3}{\sqrt{t}} + \frac{5}{t^2}$$

Category 2 – 50 Points

Find the derivative of

$$f(x) = -\frac{3}{4x} + \frac{4}{x^3} - \frac{x^4}{8}$$

$$= -\frac{3}{4}x^{-1} + 4x^{-3} - \frac{x^4}{8}$$

$$\boxed{f'(x) = \frac{3}{4x^2} - \frac{12}{x^4} - \frac{1}{2}x^3}$$

Category 3 – 10 Points

Find the derivative using the limit definition

$$f(x) = 7$$

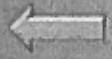
$$\boxed{= 0}$$

Category 3 – 20 Points

Find the derivative using the limit definition

$$f(x) = 2x + 3$$

$$\boxed{= 2}$$



Category 3 – 30 Points

Find the derivative using the limit definition

$$f(x) = x^2 + 2x + 3$$

$$\boxed{= 2x + 2}$$

Category 3 – 40 Points

Find the derivative using the limit definition

$$f(x) = \sqrt{x+5}$$

$$\boxed{= \frac{1}{2\sqrt{x+5}}}$$

Category 3 – 50 Points

Find the derivative using the limit definition

$$f(x)=\frac{2}{x+1}$$

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

Category 4 – 10 Points

What constants are used for acceleration due to gravity for ft/sec and m/sec?

$$\boxed{-32\,ft/\sec^2 \;\; and \;\; -9.8\,m/\sec^2}$$

Category 4 – 20 Points

Given the position function $s = -16t^2 + 560$, find the velocity at t = 3.

$v(t) = s'(t) = -32t$ $\quad v(3) = -32(3)$

$$= -96\ ft/\sec$$

Category 4 – 30 Points

A rock is shot straight up in the air with a sling shot. It had a speed of 600m/s. The row is launched with an initial height of 3 m.

$s(t) = \frac{1}{2}gt^2 + v_0t + s_0 = \frac{1}{2}(-9.8)t^2 + 600t + 3$

What is the equation relating its height as a function of time?

$$h(t) = -4.9t^2 + 600t + 3$$

Category 4 – 40 Points

Find when the velocity function is at rest.

$$s(t) = \frac{2}{3}t^3 - 6t^2 + 16t - 10$$

$v(t) = s'(t) = 2t^2 - 12t + 16$

$0 = 2(t^2 - 6t + 8)$

$0 = 2(t-2)(t-4)$

$\boxed{At\ 2\ and\ 4\ \text{sec}}$

Category 4 – 50 Points

The position of a particle is given by $s(t) = -16t^4 + 18t^3 + 50t$, where **s** is the measured in feet and **t** is measured in seconds. Find the acceleration at t = 3.

$v(t) = s'(t) = -64t^3 + 54t^2 + 50$

$a(t) = v'(t) = s''(t) = -192t^2 + 108t$

$a(3) = -192(3)^2 + 108(3)$

$= -1404\ ft/\text{sec}^2$

Category 5 – 10 Points

Find the equation of the line tangent to $f(x) = -2x^2 + 9x + 1$ at $x = 3$

$f'(x) = -4x + 9$

$f'(3) = m = -4(3) + 9$

$-12 + 3$

$m = -3$

$y_1 = f(3) = -2(3)^2 + 9(3) + 1$

$-18 + 27 + 1$

$y_1 = f(3) = 10$

$$y - 10 = -3(x - 3)$$

$$y = -3x + 19$$

Category 5 – 20 Points

Find the tangent to the curve $f(x) = 3x^2 - 2$ at $x = 1$

$f(1) = 3(1)^2 - 2$

$f(1) = 1$

$y_1 = 1$

$f'(x) = 6x$ $\quad f'(1) = m = 6$

$y - 1 = 6(x - 1)$

$$y - 1 = 6(x - 1)$$

$$y = 6x - 5$$

Category 5 – 30 Points

Find the derivative at x =1

$$f(x) = x^4 - 2x^3 + 4\sqrt{x}$$

$4x^{1/2}$

$f'(x) = 4x^3 - 6x^2 + 2x^{-1/2}$

$$= 4x^3 - 6x^2 + \frac{2}{\sqrt{x}}$$

$$= 4(1)^3 - 6(1)^2 + \frac{2}{\sqrt{1}}$$

$$= 0$$

Category 5 – 40 Points

Find the equation of the line tangent to the given function.

$$f(x) = (x+1)(4x^2 + 2x - 1);\ (3, -12)$$

$f'(x) = (4x^2+2x-1)(1) + (x+1)(8x+2)$

$f'(x) = 4x^2+2x-1 + 8x^2+8x+2x+2$

$f'(x) = 12x^2+12x+1$

$f'(3) = 12(3)^2+12(3)+1$

$f'(3) = 145$

$$y + 12 = 145(x - 3)$$

$$y = 145x - 447$$

Category 5 – 50 Points

Find the equation of the line tangent to the given function in point slope form.

$$g(x)=\frac{3x-1}{2x^2+4};x=-2$$

$$y+\frac{7}{12}=-\frac{5}{36}(x+2)$$

$g'(x)=\dfrac{(2x^2+4)(3)-(3x-1)(4x)}{(2x^2+4)^2}=\dfrac{6x^2+12-12x^2+4x}{(2x^2+4)^2}$

$g'(x)=\dfrac{-6x^2+4x+12}{(2x^2+4)^2}$

$g'(-2)=\dfrac{-6(-2)^2+4(-2)+12}{(2(-2)^2+4)^2}=\dfrac{-20}{144}=\dfrac{-5}{36}=m$

$g(-2)=\dfrac{3(-2)-1}{2(-2)^2+4}=\dfrac{-7}{12}$ (y_1)

$y+\frac{7}{12}=\frac{-5}{36}(x+2)$

$y-y_1=m(x-x_1)$