September 30, 2025

National Love People Day

Today in History:

USS *Nautilus* commissioned (1954)

James Dean dies in car accident (1955)

Number of the Day: 305

305 = 5 x 61

305 is the smallest, odd composite that is the average of two consecutive Fibonacci numbers (233 and 377).

Fun Fact:

Cows kill more Americans each year than sharks do.

Quote of the Day:

"If you never did you should. These things are fun and fun is good."

- Dr. Seuss

Today's Weather:

Sunny and warm, high 75^{o}

Math 121

Quiz #18

Find y' for

$$y = \frac{e^x + x^2 - 2\sin x}{3\cos x}$$

$$y' = \frac{(3\cos x)(e^x + 2x - 2\cos x) - (e^x + x^2 - 2\sin x)(-3\sin x)}{(3\cos x)^2}$$

Pg 172 #31

$y = e^x \cos x$ $\quad x = 0$

IF $x = 0$ $\quad y = e^0 \cos 0 = 1$

$(0, 1)$

$$\frac{dy}{dx} = e^x(-\sin x) + e^x \cos x \Big|_{x=0} = 1$$

$y - 1 = 1(x - 0)$

$y = x + 1$

CHAIN RULE

$$f(x) = (x^2+1)^2 = x^4 + 2x^2 + 1$$

$$f'(x) = 4x^3 + 4x = 4x(x^2+1)$$

$$= 2(x^2+1)^1(2x)$$

$$f(x) = (x^2+1)^{50}$$

$$f(x) = u^{50} \qquad u = x^2+1$$

$$y = f(u) = u^{50} \qquad u = x^2+1$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$= 50u^{49} \cdot (2x)$$

$$= 50(x^2+1)^{49}(2x)$$

$$\frac{d}{dx}\left[(f \circ g)(x)\right] = \frac{d}{dx}\left[f(g(x))\right]$$

$$= f'(g(x)) \cdot g'(x)$$

$f(x) = \left(\text{s} \right)^N$

$f'(x) = N\left(\text{s} \right)^{N-1} \cdot \text{s}'$

EXAMPLE 1 $f(x) = (2x + 3x^3)^4$

$f'(x) = 4(2x+3x^3)^3(2+9x^2)$

EXAMPLE 2

$f(x) = x^2(1-x^2)^4$

$f'(x) = x^2\left[4(1-x^2)^3(-2x)\right] + (1-x^2)^4(2x)$

EXAMPLE 3

$f(x) = \left(\frac{3x-1}{x^2+3}\right)^3$

$f'(x) = 3\left(\frac{3x-1}{x^2+3}\right)^2\left[\frac{(x^2+3)(3) - (3x-1)(2x)}{(x^2+3)^2}\right]$

$f(x) = e^x$ $\qquad$ $f'(x) = e^x$

$f(x) = e^{\text{sheep}}$ $\qquad$ $f'(x) = \text{sweater}\, e^{\text{sheep}}$

SHEEP $\qquad$ SWEATER

EXAMPLE 4

$f(x) = 3e^{x^2}$ $\qquad f'(x) = 3(2x)e^{x^2} = 6xe^{x^2}$

EXAMPLE 5

$f(x) = x\,e^{\sin x}$ $\qquad f'(x) = x\left(\cos x\, e^{\sin x}\right) + 1e^{\sin x}$

$f(x) = \sin x$ $\qquad f'(x) = \cos x$

$f(x) = \sin(\text{pig})$ $\qquad f'(x) = \cos(\text{bacon})$

EXAMPLE 6

$f(x) = \sin(x^3 + e^x)$

$f'(x) = (3x^2 + e^x)\cos(x^3 + e^x)$

EXAMPLE 7

$f(x) = x^2 \sin^2(x^2) = x^2 \cdot (\sin(x^2))^2$

$f'(x) = x^2\left[2(\sin(x^2))^1 \cos(x^2)\,2x\right] + 2x(\sin(x^2))^2$

$f(x) = \cos x$ $\qquad f'(x) = -\sin x$

$f(x) = \cos(\text{pumpkin})$ $\qquad f'(x) = -(\text{pot})\sin(\text{pumpkin})$

EXAMPLE 8

$f(x) = \cos(e^x)$ $\qquad f'(x) = -e^x \sin(e^x)$

$f(x) = \tan x$ $\quad f'(x) = \sec^2 x$

$f(x) = \tan(\text{JUNK})$ $\quad f'(x) = \text{JUNK}' \sec^2(\text{JUNK})$

EXAMPLE 9

$f(x) = \tan\left(\frac{e^x}{\sin x}\right)$

$$f'(x) = \left[\frac{(\sin x)e^x - e^x \cos x}{(\sin x)^2}\right] \sec^2\left(\frac{e^x}{\sin x}\right)$$

$f(x) = \sec x$ $\quad f'(x) = \sec x \tan x$

$f(x) = \sec(\text{[redacted]})$ $\quad f'(x) = \text{[redacted]}\, \sec(\text{[redacted]}) \tan(\text{[redacted]})$

EXAMPLE 10

$f(x) = \sec(\tan(\sin x))$

$f(x) = (\cos x)\sec^2(\sin x)\sec(\tan(\sin x))\tan(\tan(\sin x))$

$f(x) = \cot(\text{STUFF})$ $\quad f'(x) = -\text{STUFF}'\csc^2(\text{STUFF})$

$f(x) = \csc(\text{[redacted]})$ $\quad f'(x) = -\text{[redacted]}'\csc(\text{[redacted]})\cot(\text{[redacted]})$