

September 30, 2026

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:

Cloudy this afternoon, high 77°

Math 121

Quiz #19

Find $f'(x)$ for

$$f(x) = \left(\underline{x - 2e^{3x} + 4 \cos 5x} \right)^6$$

$$f'(x) = 6(x - 2e^{3x} + 4 \cos 5x)^5 [1 - 6e^{3x} - 20 \sin 5x]$$

mpor 19

$$\# 3 \quad f(x) = \frac{1}{(x^2 + x + 4)^3} = (x^2 + x + 4)^{-3}$$

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

$$\# 6 \quad f(x) = \sqrt{\sin^2 x + \cos^3 x}$$

$$f'(x) = \frac{1}{2} (\sin^2 x + \cos^3 x)^{-\frac{1}{2}} (2 \sin x \cos x + 3 \cos^2 x (-\sin x))$$

IMPLICIT DIFF.

$$y = x^3$$

$$\frac{dy}{dx} = 3x^2$$

$$x = y^3$$

→ ↓

$$y = \sqrt[3]{x}$$
$$= x^{\frac{1}{3}}$$

$$\frac{dy}{dx} = \frac{1}{3} x^{-\frac{2}{3}}$$

$$\frac{d}{dx} [x^3] = 3x^2 \quad \cancel{\frac{dy}{dx}}$$

$$\frac{d}{dx} [y^3] = 3y^2 \left[\frac{dy}{dx} \right]$$

$$\frac{d}{dx} [x + 3y^2] = 1 + 6y \frac{dy}{dx}$$

$$\frac{d}{dx} [x y^2] = x \cdot 2y \frac{dy}{dx} + y^2$$

EXAMPLE 1

$$y^3 + y^2 - 5y - x^2 = -4$$

$$3y^2 \frac{dy}{dx} + 2y \frac{dy}{dx} - 5 \frac{dy}{dx} - 2x = 0$$

$$3y^2 \frac{dy}{dx} + 2y \frac{dy}{dx} - 5 \frac{dy}{dx} = 2x$$

$$\frac{dy}{dx} (3y^2 + 2y - 5) = 2x$$

$$\underline{\underline{\frac{dy}{dx} = \frac{2x}{3y^2 + 2y - 5}}}$$

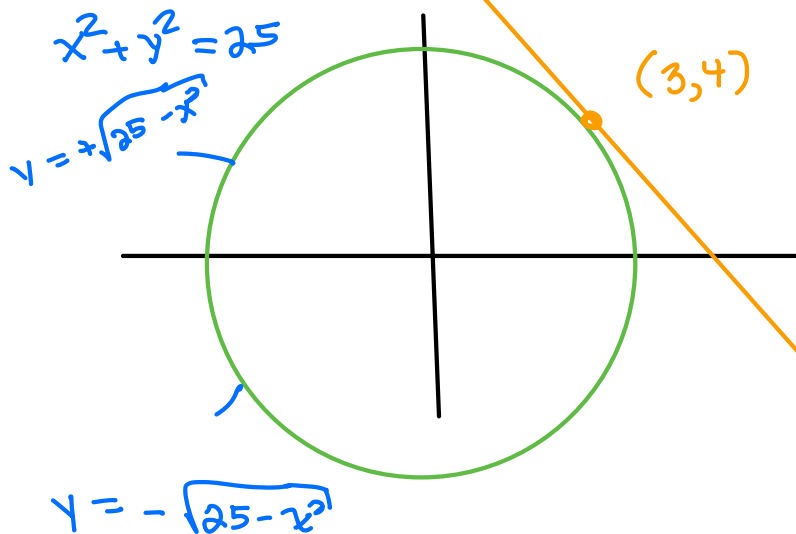
Example 2

$$\frac{d}{dx} (x^2 + y^2 = 25)$$

$$2x + 2y \frac{dy}{dx} = 0$$

$$2y \frac{dy}{dx} = -2x$$

$$\frac{dy}{dx} = -\frac{x}{y}$$



$$\text{SLOPE} = -\frac{3}{4}$$

$$x^2 + y^2 = 25$$

$$y^2 = 25 - x^2$$

$$y = \pm \sqrt{25 - x^2}$$

$$\frac{dy}{dx} = \pm \frac{1}{2} (25 - x^2)^{-\frac{1}{2}} (-2x)$$

$$= \pm \frac{-x}{\sqrt{25 - x^2}} = \mp \frac{x}{y}$$

EXAMPLE 3

SLOPE & EQU OF
TANGENT LINE AT (3,1)
Pl

TO

$$\underline{3(x^2 + y^2)^2 = 100xy}$$

$$6(x^2 + y^2)(2x + 2y \frac{dy}{dx}) = 100(x \frac{dy}{dx} + y)$$

$$6(9+1)(6 + 2 \frac{dy}{dx}) = 100(3 \frac{dy}{dx} + 1)$$

$$360 + 120 \frac{dy}{dx} = 300 \frac{dy}{dx} + 100$$

$$260 = 180 \frac{dy}{dx}$$

$$\frac{dy}{dx} = \frac{260}{180} = \frac{13}{9} = m$$

$$y - 1 = \frac{13}{9} (x - 3)$$

EXAMPLE 4

$$\underline{x^2 + y^2 = 25}$$

2ND DER.

$$\cancel{2x} + \cancel{2y} \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = -\frac{x}{y}$$

$$\frac{d^2y}{dx^2} = \frac{y(-1) - (-x)\frac{dy}{dx}}{y^2}$$

$$= \frac{-y + x \frac{dy}{dx}}{y^2}$$

$$= \frac{-y + x \left(-\frac{x}{y}\right)}{y^2}$$

$$= - \frac{y + \frac{x^2}{y}}{y^2} \cdot \frac{y}{y}$$

$$= - \frac{y^2 + x^2}{y^3} = - \frac{25}{y^3}$$

EXAMPLE 5

$$\frac{d}{dt} (x^2 + y^2 = 25)$$

$$\cancel{2}x \frac{dx}{dt} + \cancel{2}y \frac{dy}{dt} = 0$$

$$x \frac{dx}{dt} + y \frac{dy}{dt} = 0$$