

October 13, 2025

National M&M Day

Today in History:

White House cornerstone laid (1792)

Continental Navy established (1775)

Number of the Day: 57

57 = 3 x 19

57 is a semiprime.

Fun Fact:

The word “set” has 464 definitions in the Oxford English Dictionary.

Quote of the Day:

“Many men go fishing all of their lives without knowing that it is not fish they are after.”

Henry David Thoreau

Today's Weather:

Sunny, high 67°

Math 121

Quiz #25

Pick up Blue Book.

T2 R1

*19 $f(x) = x^{(x^2)}$

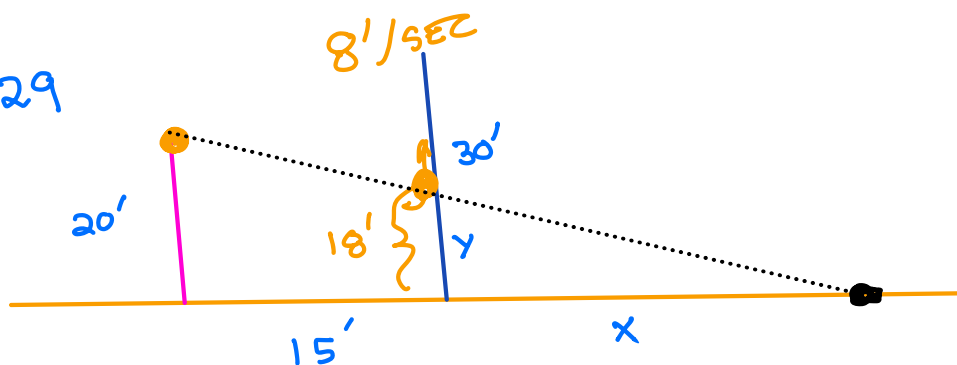
$$\frac{d}{dx} (\ln(f(x))) = \ln x^{(x^2)} = x^2 \ln x$$

$$\frac{1}{f(x)} \cdot f'(x) = x^2 \left(\frac{1}{x}\right) + 2x \ln x$$

$$\begin{aligned} f'(x) &= f(x) [x + 2x \ln x] \\ &= x^{(x^2)} [x + 2x \ln x] \end{aligned}$$

T2 R1

*29



$$\frac{x}{y} = \frac{x+15}{20}$$

$$20x = y(x+15)$$

$$20x = xy + 15y$$

$$\frac{dy}{dt} = 8$$

$$\frac{dx}{dt} = ?$$

$$y = 18$$

$$20 \left[\frac{dx}{dt} \right] = x \frac{dy}{dt} + y \left[\frac{dx}{dt} \right] + 15 \frac{dy}{dt}$$

$$\frac{x}{18} = \frac{x+15}{20}$$

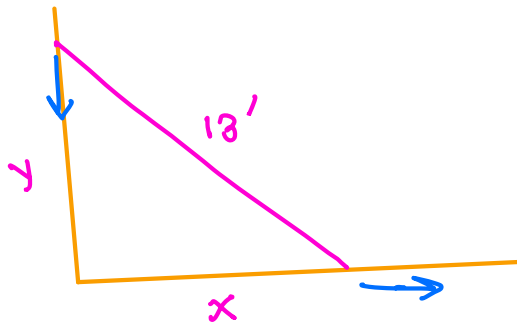
$$20x = 18x + 270$$

$$x = 135$$

$$20 \frac{dx}{dt} = (135)(8) + 18 \left(\frac{dx}{dt} \right) + (15)(8)$$

$$\frac{dx}{dt} = 600' / \text{SEC}$$

F 2023
5b



$$x^2 + y^2 = 169$$

$$x = 5$$

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

$$\frac{dy}{dt} = -2$$

$$y = 12$$

$$25 + y^2 = 169$$

$$y^2 = 144$$

$$y = 12$$

$$5 \left(\frac{dx}{dt} \right) + (12)(-2) = 0$$

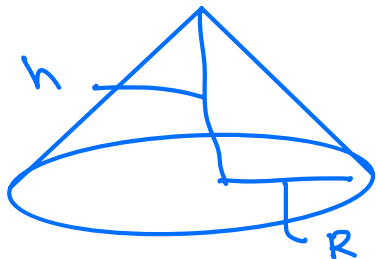
$$\frac{dx}{dt} = \frac{24}{5}$$

$$A = \frac{1}{2} x y$$

$$\frac{dA}{dt} = \frac{1}{2} \left[x \frac{dy}{dt} + y \frac{dx}{dt} \right]$$

$$= \frac{1}{2} \left[5(-2) + 12 \left(\frac{24}{5} \right) \right] = \frac{119}{5} \text{ ft}^2 / \text{min}$$

T2R1
*28



$$V = \frac{1}{3} \pi R^2 h$$

$$\frac{dV}{dt} = \frac{1}{3} \pi \left(R^2 \frac{dh}{dt} + 2Rh \frac{dR}{dt} \right)$$

$$h = 16 \quad R = 4 \quad \frac{dh}{dt} = -4 \quad \frac{dR}{dt} = -1$$

$$= \frac{1}{3} \pi (16(-4) + 2(4)(16)(-1))$$

$$= -64\pi \text{ cm}^3/\text{SEC}$$

F2022)

(2C)

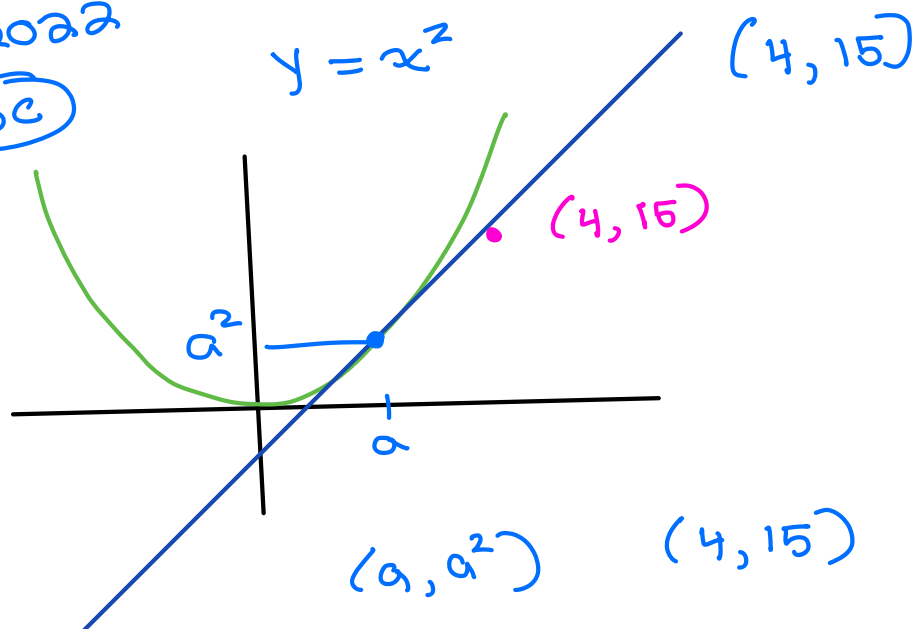
$$f(x) = \arcsin x - \sqrt{1-x^2}$$

$$f'(x) = \frac{1}{\sqrt{1-x^2}} + \frac{1}{\cancel{2}} (1-x^2)^{-\frac{1}{2}} (\cancel{+2}x)$$

$$= \frac{1}{\sqrt{1-x^2}} + \frac{x}{\sqrt{1-x^2}}$$

F 2022

(3c)



$$m = \frac{a^2 - 15}{a - 4}$$

$$\frac{dy}{dx} = 2x \Big|_{x=a} = 2a$$

$$\frac{a^2 - 15}{a - 4} = 2a$$

$$a^2 - 15 = 2a(a - 4)$$

$$a^2 - 15 = 2a^2 - 8a$$

$$a^2 - 8a + 15 = 0$$

$$(a - 3)(a - 5) = 0$$

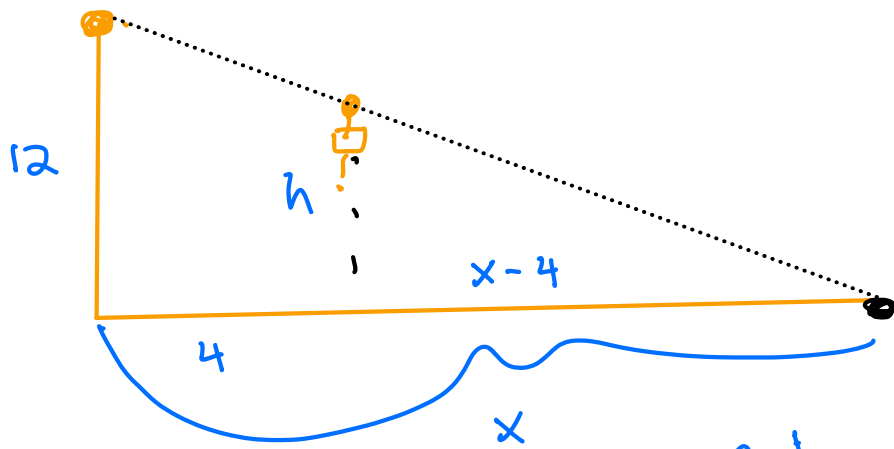
$$a = 3, 5$$

$$(3, 9)$$

$$(5, 25)$$

F20a)

5b



$$\frac{x-4}{h} = \frac{x}{12}$$

$$h = 8$$

$$\frac{dh}{dt} = -16$$

$$12(x-4) = xh$$

$$12x - 48 = xh$$

$$12 \left[\frac{dx}{dt} \right] = x \frac{dh}{dt} + h \left[\frac{dx}{dt} \right]$$

$$\frac{x-4}{8} = \frac{x}{12}$$

$$x = 12$$

$$12 \left(\frac{dx}{dt} \right) = 12(-16) + 8 \left(\frac{dx}{dt} \right)$$

$$\frac{dx}{dt} = -48 \text{ ft/sec}$$

F2021

(3C)

$$f(x) = x^2 \cos(2x)$$

$$f'(0)$$

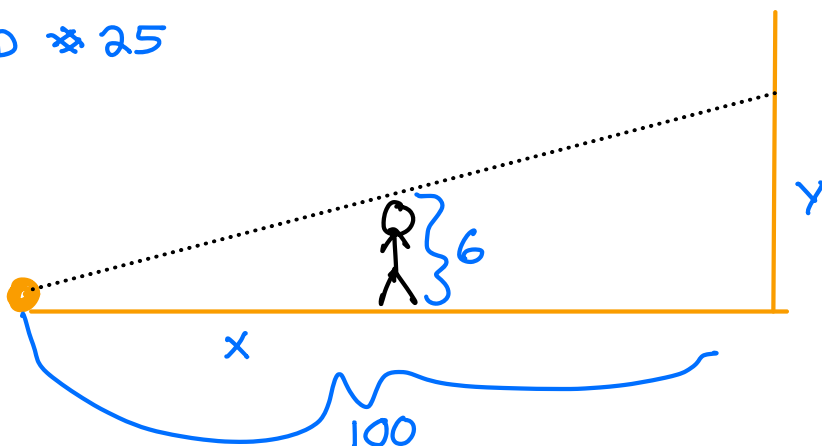
$$f'(x) = x^2 (-\sin(2x))2 + 2x \cos(2x)$$

$$f'(x) = -2x^2 \sin(2x) + 2x \cos(2x)$$

$$f''(x) = \frac{-2x^2 \cos(2x)(2)}{1} + \frac{\sin(2x)(-4x)}{1} + \frac{2x(-\sin 2x)(2)}{1} + \frac{2 \cos(2x)}{1}$$

$$f''(0) = 2$$

mpod * 25



$$\frac{6}{x} = \frac{y}{100}$$

$$\underline{600 = xy}$$

$$0 = x \left[\frac{dy}{dt} \right] + y \frac{dx}{dt}$$

$$(600) = 50y$$

$$y = 12$$

$$x = 50$$

$$\frac{dx}{dt} = 5$$

$$0 = (50) \frac{dy}{dt} + 12(5)$$

$$\frac{dy}{dt} = -\frac{60}{50} = -1.2$$

F 2019

6a

$$\lim_{h \rightarrow 0} \frac{\text{ARCTAN}(2+h) - \text{ARCTAN}(2)}{h}$$

$$f(x) = \text{ARCTAN } x$$

$$f'(2) = \lim_{h \rightarrow 0} \frac{\text{ARCTAN}(2+h) - \text{ARCTAN}(2)}{h}$$

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

$$f'(2) = \frac{1}{1+2^2} = \frac{1}{5}$$