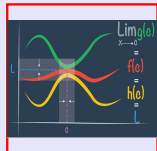


Math 261
Fall 2023
Lecture 36



Feb 19-8:47 AM

At noon, ship A is 100 km west of ship B.

Ship A is going south $\frac{dB}{dt} = 25$ at 35 km/h.

Ship B is going north at 25 km/h.

How fast is the distance between them changing at 4:00 PM?

$\frac{dA}{dt} = 35 \text{ km/h}$

$C, \frac{dC}{dt}$ at 4:00 PM

12:00 - 4:00
4 hrs

$A = 4(35) = 140$
 $B = 4(25) = 100$

$100^2 + 240^2 = C^2$

$C = \sqrt{100^2 + 240^2}$

$C = 260$

$(A+B)^2 + 100^2 = C^2$

$2(A+B) \left[\frac{dA}{dt} + \frac{dB}{dt} \right] = 2C \frac{dC}{dt}$

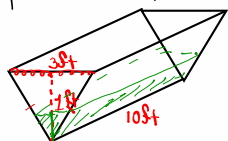
$(140+100) [35+25] = 260 \frac{dC}{dt}$

$\frac{dC}{dt} = \frac{240 \cdot 60}{260}$

$\approx 55.4 \text{ km/h}$

Nov 1-10:27 AM

A trough is 10 ft long and its ends have a shape of isosceles triangle that are 3 ft across on top and a height of 1 ft.



Trough is being filled with water @ 12 ft³/min

$$\frac{dV}{dt} = 12 \text{ ft}^3/\text{min}$$

$V = \text{Area of the base} \cdot \text{height}$
Triangle

$$= \frac{bh}{2} \cdot 10$$



$$\frac{b}{h} = \frac{3}{1} \\ b = 3h$$

$$V = 5bh$$

$$V = 5 \cdot 3h \cdot h = 15h^2$$

$$V = 15h^2$$

$$\frac{dV}{dt} = 30h \frac{dh}{dt}$$

$$12 = 30 \cdot \frac{1}{2} \cdot \frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{12}{15} = \frac{4}{5} = .8 \text{ ft/min}$$

Review this Problem

Nov 1-10:39 AM

$$f(x) = (x+1)^5 - 5x - 2$$

$$f'(x) = 5(x+1)^4 \cdot 1 - 5$$

$$f'(x) = 5(x+1)^4 - 5$$

$$f'(x) = 0$$

$$5(x+1)^4 - 5 = 0$$

$$f''(x) = 5 \cdot 4(x+1)^3 \cdot 1 - 0$$

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

$$f''(x) = 20(x+1)^3$$

$$x+1 = \pm \sqrt[4]{1}$$

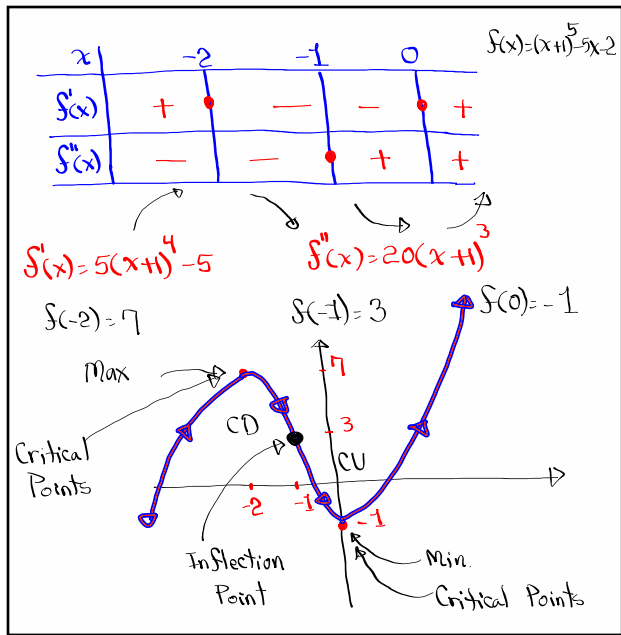
$$x = -1 \pm 1$$

$$f''(x) = 0 \rightarrow \boxed{x = -1}$$

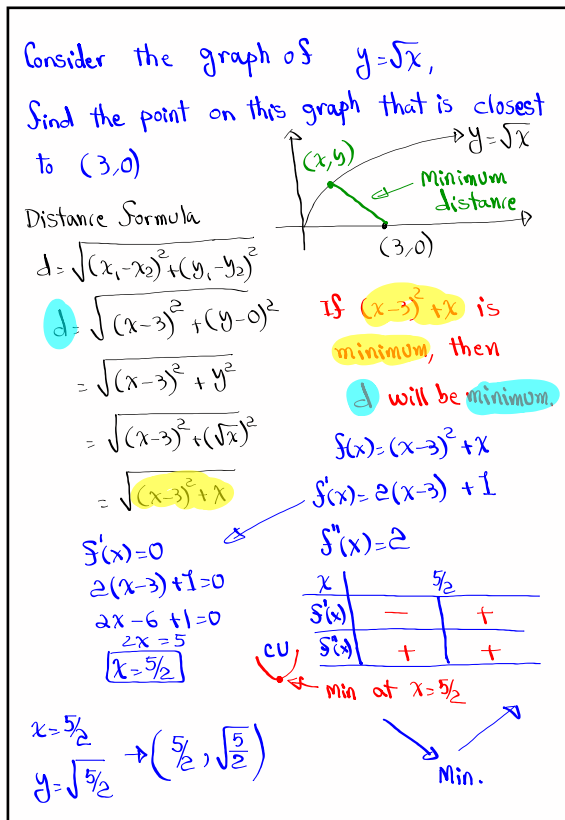
$$\boxed{x = -2}, \boxed{x = 0}$$

$f'(x)$ is defined $(-\infty, \infty)$

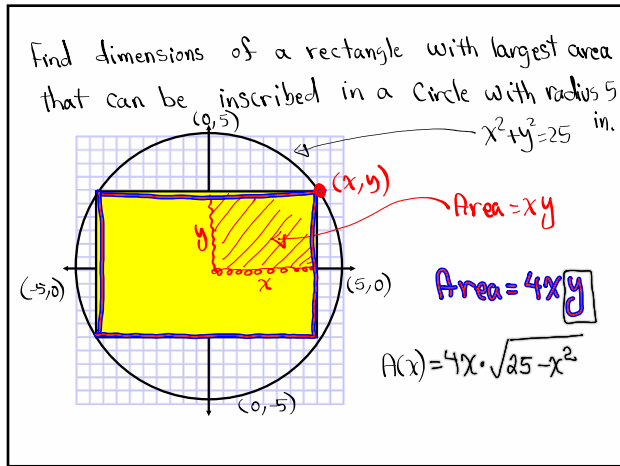
Nov 1-10:52 AM



Nov 1-10:55 AM



Nov 1-11:06 AM



Nov 1-11:17 AM

$$A(x) = 4x \cdot \sqrt{25 - x^2}$$

$$A(x) = 4x \cdot (25 - x^2)^{1/2}$$

$$A'(x) = 4 \left[1(25 - x^2)^{1/2} + x \cdot \frac{1}{2}(25 - x^2)^{-1/2} \cdot (-2x) \right]$$

$$= 4 \left[(25 - x^2)^{1/2} - x^2(25 - x^2)^{-1/2} \right]$$

$$= 4(25 - x^2)^{-1/2} \left[(25 - x^2) - x^2 \right]$$

$$= 4(25 - x^2)^{-1/2} (25 - 2x^2)$$

$$A'(x) = \frac{4(25 - 2x^2)}{\sqrt{25 - x^2}}$$

$$A'(x) = 0$$

$$25 - 2x^2 = 0$$

$$x^2 = \frac{25}{2} \quad x = \frac{5}{\sqrt{2}}$$

$$x \approx 3.5$$

x	3.5
$A'(x)$	+
	-

Max. Area when $x = \frac{5}{\sqrt{2}}$

$w = 2y$

$L = 2x$

$x^2 + y^2 = 25$

$\frac{25}{2} + y^2 = 25$

$y = \frac{5}{\sqrt{2}}$

$\frac{10}{\sqrt{2}}$ by $\frac{10}{\sqrt{2}}$

$5\sqrt{2}$ by $5\sqrt{2}$

Nov 1-11:23 AM