Which of the following function is decreasing on $\boxed{\left(0, \frac{\pi}{2}\right)}$?

$\sec^2 x > 0$

(a) sin 2x

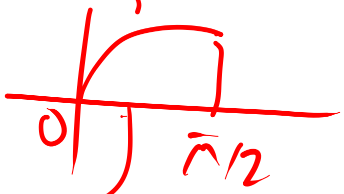
(b) tan x

~~(c)~~ cos x

(d) cos 3x

$f(x) = \cos x$

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



$f'(x) < 0$

If $f(x) = \cos x$, then $\rightarrow f'(x) = -\sin x$

(a) $f(x)$ is strictly decreasing in $(0, \pi)$

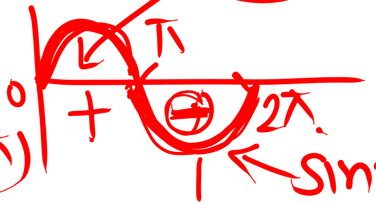
(b) $f(x)$ is strictly increasing in $(0, 2\pi)$ $(\pi, 2\pi)$

(c) $f(x)$ is neither increasing nor decreasing in $(\pi, 2\pi)$ $(0, 2\pi)$

(d) All the above are correct

$\rightarrow f'(x) = -\sin x$

$f'(x) = -\text{ive} \rightarrow (0, \pi)$



$f'(x) = -\text{ive} \rightarrow (0, \pi)$

$+\text{ive} \rightarrow (\pi, 2\pi)$

$(0, 2\pi) \rightarrow$ Neither ↑ nor ↓

ABLES KOTA

The volume V and depth x of water in a vessel are connected by the relation $V = 5x - \dfrac{x^2}{6}$ and the volume of water is increasing, at the rate of 5 cm^3/sec, when x = 2 cm. The rate at which the depth of water is increasing, is

(a) $\dfrac{5}{18}$ cm / sec (b) $\dfrac{1}{4}$ cm / sec

(c) $\dfrac{5}{16}$ cm / sec (d) None of these

$\boxed{V = 5x - \dfrac{x^2}{6}}$ ... (1)

$\Rightarrow \dfrac{dV}{dt} = \cancel{5 - \dfrac{2x}{6}} = 5 - \dfrac{x}{3}$

$\rightarrow \dfrac{dv}{dt} = 5\dfrac{dx}{dt} - \dfrac{2x}{6} \times \dfrac{dx}{dt}$

$\Rightarrow 5 = \dfrac{dx}{dt}\left[5 - \dfrac{x}{3}\right]$

$\rightarrow \dfrac{dx}{dt} = \dfrac{5}{\frac{15-x}{3}} = \dfrac{5 \times 3}{15 - x}$

$\rightarrow x = 2$

$\dfrac{dx}{dt} = \dfrac{15}{15-2} = \dfrac{15}{13}$ cm/sec

$V = 5x - \dfrac{x^2}{6}$

$\because \dfrac{dV}{dt} = 5\ cm^3/s \rightarrow \boxed{x = 2} \rightarrow \dfrac{dx}{dt} = ?$

Shape → No info

A ladder is resting with the wall at an angle of 30°. A man is ascending the ladder at the rate of 3 ft/sec. His rate of approaching the wall is → according to fig. →

(a) 3 ft / sec

(b) $\frac{3}{2}$ ft / sec

(c) $\frac{3}{4}$ ft / sec

(d) $\frac{3}{\sqrt{2}}$ ft / sec

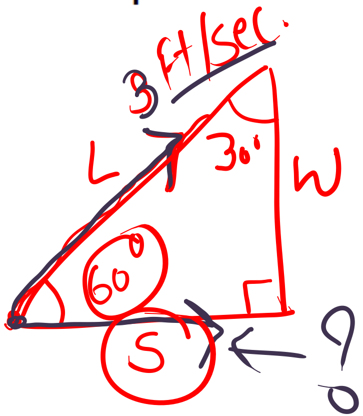
$\therefore R = \boxed{3 \text{ ft/sec}}$

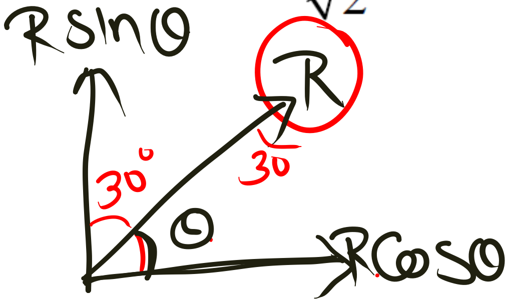
$S = R\cos\theta$

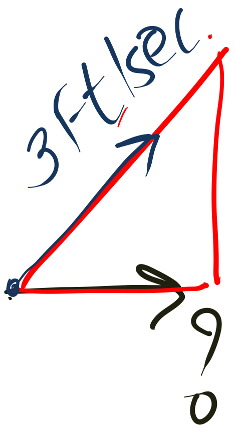
$S = 3 \times \cos 60$

$3 \times \frac{1}{2}$

$= 1.5$







ABLES KOTA

What is the interval in which the function $f(x) = \sqrt{9 - x^2}$ is increasing? $(f(x)>0)$

(a) $0<x<3$ (b) $-3<x<0$

(c) $0<x<9$ (d) $-3<x<3$

$F^n \to$ img

$-3<x<3$

$f'(x) \to -3<x<0$

$x<0$

$\to f(x) = \sqrt{9-x^2}$

$f'(x) = \boxed{\frac{1}{2\sqrt{9-x^2}} \times -2x > 0}$

$-2x > 0$

$\boxed{x<0}$

$\sqrt{9-x^2} \to$ Real

$\boxed{9-x^2>0}$

$x^2-9<0$

$(x-3)(x+3)<0$

$x=3,-3$

What is the slope of the normal at the point $(at^2, 2at)$ of the parabola $y^2 = 4ax$?

(a) $\frac{1}{t}$

(b) t

(c) $-t$

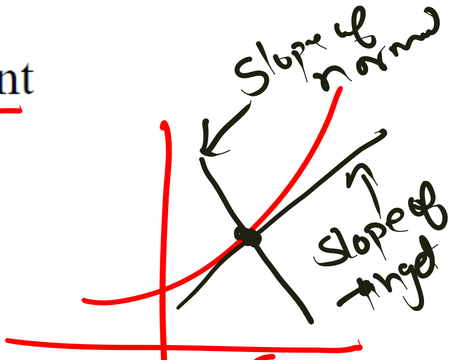
(d) $-\frac{1}{t}$

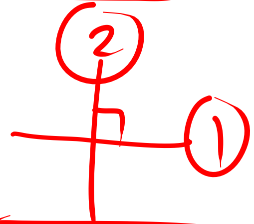
$\Rightarrow y^2 = 4ax$

Slope of tangent $= \frac{dy}{dx}$

Slope of normal $= -\left(\frac{dx}{dy}\right)$

$\Rightarrow 2y\frac{dy}{dx} = 4a \Rightarrow \frac{dy}{dx} = \frac{4a}{2y} = \frac{2a}{y}$





$m_1 \cdot m_2 = -1$

$\frac{dy}{dx} \cdot m_2 = -1$

$m_2 = \frac{-1}{dy/dx} = -\left(\frac{dx}{dy}\right)$

So slope of normal

$= -\left(\frac{dx}{dy}\right) = -\left(\frac{y}{2a}\right)$

at $(at^2, 2at)$

$\Rightarrow -\left(\frac{dx}{dy}\right) = -\left(\frac{2at}{2a}\right)$

$= -t$

The maximum value of the function

$y = -x^2$ in the interval $[-1, 1]$ is

$y = -x^2$

$\boxed{x^2 \geq 0}$ — 1

(a) 0 (b) 2

(c) 8 (d) 9

y $\boxed{-x^2 \leq 0}$

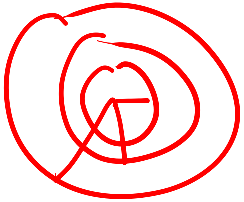
$-x^2 \geq 0$

$-x^2 \leq 0$ max → 0

A stone is dropped into a quiet lake and waves moves in circles at the speed of 5 cm/s. If at a instant, the radius of the circular wave is 8 cm, then the rate at which enclosed area is increasing, is

(a) $20\,\pi\ cm^2/s$ (b) $40\,\pi\ cm^2/s$

(c) $60\,\pi\ cm^2/s$ (d) $80\,\pi\ cm^2/s$



$\rightarrow \dfrac{dr}{dt} = 5\ cm/sec$

$\rightarrow \boxed{r=8} \rightarrow \dfrac{dA}{dt}\uparrow$

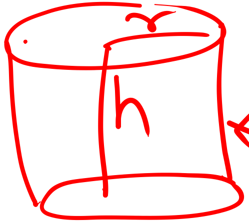
$\rightarrow \dfrac{d(\pi r^2)}{dt} = \pi\, 2r \cdot \dfrac{dr}{dt} = \pi \times 2 \times 8 \times 5$

$= 80\pi\ cm^2/sec$

The radius of a cylinder is increasing at the rate of 3 m/s and its altitude is decreasing at the rate of 4 m/s. The rate of change of volume when radius is 4 m and altitude is 6m, is

(a) $20\pi\, m^3/s$ (b) $40\pi\, m^3/s$

(c) $60\pi\, m^3/s$ (d) None of these



$\frac{dr}{dt} = 3\, m/s$, $\frac{dh}{dt} = -4\, m/sec$

$\frac{dV}{dt} = ?$ → at $r = 4m$ & $h = 6m$

$\frac{d}{dt}[\pi r^2 h] = \pi \frac{d}{dt}(r^2 h)$

$\frac{dV}{dt} = \pi\left[r^2 \frac{dh}{dt} + h \cdot 2r \cdot \frac{dr}{dt}\right]$

$\frac{dV}{dt} = \pi\left[(4^2) \cdot (-4) + 6 \times 2 \times 4 \times 3\right]$

$= \pi[-64 + 144]$

$= \pi\, 80\ m^3/sec$

$18 \times 8 = 144$, 6

If sum of two numbers is 3, the maximum value of the product of first and the square of second is

(a) 4 (b) 3

(c) 2 (d) 1

$$x + y = 3$$

$$x(y^2) = ?$$

x	y	3	xy^2
1	2	3	4
0	3	3	0
3	0	3	0
2	1	3	2

1	2	3	4	5	6	7	8	9	10
C	A	D	B	B	C	A	D	D	A