The function $f(x) = \tan x - 4x$ is strictly decreasing on

$f'(x) = \boxed{\sec^2 x - 4}$

$f'(x) = 0$

$\sec^2 x = 4$

$\sec x = \pm 2$

$\sec x = 2, \ \sec x = -2$

$\boxed{x = \pi/3}$ $\quad \boxed{x = \pm\pi/3}$

(a) $\left(-\frac{\pi}{3}, \frac{\pi}{3}\right)$

(b) $\left(\frac{\pi}{3}, \frac{\pi}{2}\right)$

(c) $\left(-\frac{\pi}{3}, \frac{\pi}{2}\right)$

(d) $\left(\frac{\pi}{2}, \pi\right)$

$\Rightarrow -\frac{\pi}{3} < x < \frac{\pi}{3} \Rightarrow$ ① ② ③ $\quad -\infty \quad -\frac{\pi}{3} \quad \pi/6 \quad \pi/3 \quad \infty$

$\Rightarrow f'(30) = \sec^2 30 - 4$

$\left(\frac{2}{\sqrt{3}}\right)^2 - 4 = \frac{4}{3} - 4 \to -ve$

$\Rightarrow \sec$

$f'(60) = \sec^2 60 - 4$

$(2)^2 - 4 = 0$

$\geq \quad \leq$

Q. The equation of all lines having slope 2 which are tangent to the curve $y = \frac{1}{x-3}, x \neq 3$, is

so there is no tangent to the curve which have slope 2.

(a) $y = 2$ (b) $y = 2x$

(c) $y = 2x + 3$ (d) None of these

Soln:-

$$\frac{dy}{dx} = \frac{-1}{(x-3)^2} = 2 \text{ (given)}$$

$$\Rightarrow -1 = 2(x-3)^2 \Rightarrow (x-3)^2 = -\frac{1}{2}$$

$$\Rightarrow (x-3) = \sqrt{-\frac{1}{2}} \text{ (Not possible)}$$

If the error committed in measuring the radius of sphere, then ... will be the percentage error in the surface area.

(a) 1% (b) 2%

$A = 4\pi r^2$

(c) 3% (d) 4%

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The maximum value of $\frac{\ln x}{x}$ in $(2, \infty)$ is $\frac{1}{2.71}$ $\log_e e = 1$

(a) 1 $f(x) = \frac{\ln x}{x}$ (b) e 2.0

$f'(x) = \frac{x \cdot \frac{1}{x} - \ln x \cdot 1}{x^2}$ e^x

(c) 2/e (d) 1/e

$f'(x) = 0 \Rightarrow \boxed{\frac{1 - \ln x}{x^2}} = 0 \Rightarrow \ln x = 1$ 0

$\Rightarrow \boxed{x = e}$ ✓

$f''(x) = \frac{x^2 \cdot \left(\frac{-1}{x}\right) - (1 - \ln x)\, 2x}{x^4} = \frac{-e - (1 - \ln e) \cdot 2e}{e^4}$

at $x = e \Rightarrow \boxed{f''(x) \rightarrow -\text{ive} < 0}$ $\frac{-e}{e^4} = \frac{1}{e^3} = -\text{ive}$

point of maxima

So max. value of func.

$\Rightarrow \frac{\ln x}{x} = \frac{\ln e}{e}$

$= \frac{1}{e}$ Ans

The angle of intersection to the curve $y = x^2$, $6y = 7 - x^3$ at $(1, 1)$ is :

(a) $\frac{\pi}{2}$

(b) $\frac{\pi}{4}$

(c) $\frac{\pi}{3}$

(d) π

$y = x^2$

$\left.\frac{dy}{dx}\right|_{1,1} = 2x = \boxed{2 = m_1}$

$\boxed{\frac{m_1}{m_2}}$

$\boxed{m_1 m_2 = -1}$

$\boxed{m_1 = m_2}$

$6y = 7 - x^3$

$6 \cdot \frac{dy}{dx} = 0 - 3x^2 \Rightarrow \frac{dy}{dx} = -\frac{\cancel{3}\,x^2}{\cancel{6}\,2}$

$\left.\frac{dy}{dx}\right)_{(1,1)} = -\frac{1}{2}(1)^2 = -\frac{1}{2} = m_2$

$\Rightarrow m_1 \cdot m_2 = 2 \times -\frac{1}{2} = -1$

If $f(x) = 3x^4 + 4x^3 - 12x^2 + 12$, then $f(x)$ is $\Rightarrow (\infty, -2)$

(a) increasing in $(-\infty, -2)$ and in $(0, 1)$ $\rightarrow f'(x)$

(b) increasing in $(-2, 0)$ and in $(1, \infty)$

(c) decreasing in $(-2, 0)$ and in $(0, 1)$

(d) decreasing in $(-\infty, -2)$ and in $(1, \infty)$

$$f'(x) = 12x^3 + 12x^2 - 24x$$
$$= 12x(x^2 + x - 2)$$
$$= 12x[x^2 + 2x - x - 2]$$
$$= 12x[x(x+2) - 1(x+2)]$$
$$= 12x(x-1)(x+2) = 0$$

$-\infty$ ① ② ③ ④ ∞

$-$ -2 $+$ 0 $-$ 1 $+$

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Water is dripping out from a conical funnel of semi-vertical angle $\frac{\pi}{4}$ at the uniform rate of $2\ cm^2/s$ is the surface area through a tiny hole at the vertex of the bottom. When the slant height of cone is 4 cm, then rate of decrease of the slant height of water is

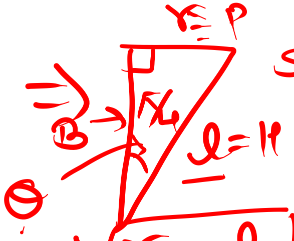
(a) $\frac{\sqrt{2}}{3\pi}\ cm/s$ (b) $\frac{\sqrt{2}}{\pi}\ cm/s$

(c) $\frac{\sqrt{2}}{4\pi}\ cm/s$ (d) None of these

Here: $\frac{dS}{dt} = 2\ cm^2/sec$

$S = \pi r l$

when $l = 4cm \to \frac{dl}{dt} = ?$



$\sin\theta = \frac{P}{H}$

$l = H$

$\sin\frac{\pi}{4} = \frac{r}{l} \Rightarrow r = l\cdot\sin\frac{\pi}{4}$

$\Rightarrow \boxed{r = \frac{l}{\sqrt{2}}} \to S = \pi \cdot \frac{l}{\sqrt{2}} \cdot l = \boxed{\frac{\pi l^2}{\sqrt{2}} = S}$

$\Rightarrow$ diff $\to \frac{dS}{dt} = \frac{\pi}{\sqrt{2}}\left(2l \times \frac{dl}{dt}\right)$

$\Rightarrow \cancel{2} = \frac{\pi}{\sqrt{2}} \times \cancel{2} \times 4 \times \frac{dl}{dt}$

$\Rightarrow \boxed{\frac{\sqrt{2}}{4\pi} = \frac{dl}{dt}}$

If the radius of a spherical balloon increases by 0.2%. Find the percentage increase in its volume

(a) 0.8%

(b) 0.12%

(c) 0.6%

(d) 0.3%

$100 \rightarrow 0.2\%$

Vol $\rightarrow$ Vol.

$\dfrac{\text{diff} \times 100}{\text{Ac. Vol}}$

Volume $= \frac{4}{3}\pi r^3$

3×0.2

$= 0.6\%$

Area $= \pi r^2$

$2 \times 0.2 = 0.4\%$

Each side of an equilateral triangle expands at the rate of 2 cm/s. What is the rate of increase of area of the triangle when each side is 10 cm?

$\frac{\sqrt{3}}{\cancel{4}} \times \cancel{2}x \times 10 \times \cancel{2}$

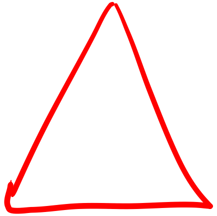
$= 10\sqrt{3}\ cm^2/sec.$

(a) $10\sqrt{2}\ cm^2/s$

(b) $10\sqrt{3}\ cm^2/s$

(c) $10\ cm^2/s$

(d) $5\sqrt{3}\ cm^2/s$



$\rightarrow$ let side $= x$ cm

$\frac{dx}{dt} = \boxed{2\ cm/s}$

$\rightarrow \frac{dA}{dt} \rightarrow$ at $x = 10$ cm

$\because A = \frac{\sqrt{3}}{4} \times (x)^2 \Rightarrow$ diff $\rightarrow \frac{dA}{dt} = \frac{\sqrt{3}}{4} \times 2x \times \frac{dx}{dt}$

Angle formed by the positive Y-axis and the tangent to $y = x^2 + 4x - 17$ at $\left(\frac{5}{2}, \frac{-3}{4}\right)$ is

(a) $\tan^{-1} 9$ (b) $\frac{\pi}{2} - \tan^{-1} 9$

(c) $\frac{\pi}{2} + \tan^{-1} 9$ (d) $\frac{\pi}{2}$

$\boxed{\frac{\pi}{2} - \theta}$

θ

angle formed by tangent with +ive y axis is :-

$\frac{\pi}{2} - \theta$

$\boxed{\frac{\pi}{2} - \tan^{-1} 9}$

$\Rightarrow y = x^2 + 4x - 17$

$\frac{dy}{dx} = 2x + 4 \Rightarrow \left.\frac{dy}{dx}\right|_{\frac{5}{2}, \frac{-3}{4}} = 2\left(\frac{5}{2}\right) + 4$

$\frac{dy}{dx} = \boxed{9 = \tan\theta} \Rightarrow \boxed{\theta = \tan^{-1} 9}$

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