1. Find $\frac{dy}{dx}$ for each of the following cases :
   a) $y = \cos(2-3x)$
   b) $y = x^2 \sin 2x$

2. Given $y + \cos y = x + \cos x$, find $\frac{dy}{dx}$.

3. Given $y = 2^{x^2}$, find $\frac{dy}{dx}$.

4. Find $\frac{dy}{dx}$ if $\ln(xy) = e^y$.

5. Find y'' for equation $x^2 + y^2 = 5x + 4y$ at point $(5, 0)$.

6. If $y = e^x \ln(1+x)$, show that $(x+1)^2\left(\frac{d^2y}{dx^2} - \frac{dy}{dx}\right) = xe^x$.

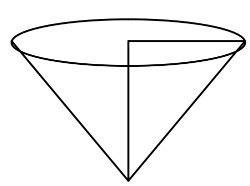
7. If $y = \ln(\cos x + 1)$, show that $\sin x\frac{d^2y}{dx^2} - \frac{dy}{dx} = 0$.

8. Given $x = 2t - \frac{1}{t}$ and $y = t + \frac{4}{t}$, where t is a non-zero parameter.

   Show that $\frac{dy}{dx} = \frac{1}{2}\left(1 - \frac{9}{2t^2+1}\right)$.

9. Given that $f(x) = x^4 - 2x^2 + 1$. Use the first derivative test to determine the local extremum of $f(x)$.

10.



In the diagram, a oil tank in the shape of circular cone has a radius of 30 m and a height of 8 m. Oil is pumped into the tank at the rank of 45 m^3/ minute. Calculate the rate of change of the height of oil in the tank when the depth of water is 3m. Give the answer correct to 3 decimal places.

ANSWER

1 a) $3\sin(2-3x)$

b) $2x^2\cos 2x + 2x\sin 2x$

2) $\dfrac{1-\sin x}{1-\sin y}$

3) $2^{x^2+1}x\ln 2$

4) $\dfrac{y}{x(ye^y-1)}$

5) $\dfrac{41}{32}$

9) maximum point : (0, 1) ; minimum points: (-1, 0) , (1, 0)

10) 0.113 m/minute