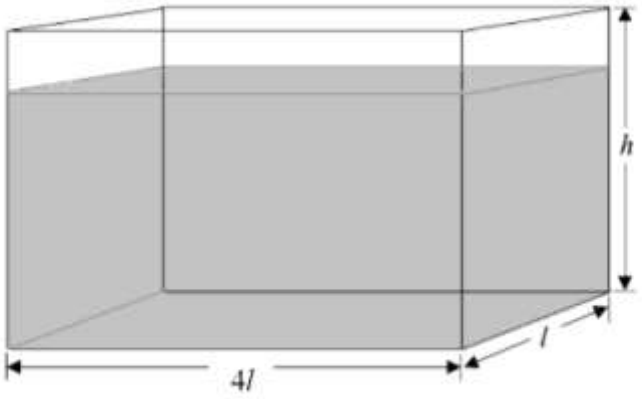
EQUITY
LEARNING PLACE

Sec 4 Differentiation Revision

1) Find the equation of normal to the curve $y = \sqrt{2 - x}$ at $x = 1$. [3]

2) Given that $f(x) = \frac{3x}{x^2+1}$, find the range of values of x for which $f(x)$ is increasing. [5]

3) Jevier constructed an opened fish tank with a rectangular base of length $4l$ m, breadth l m and height h m. He wanted the total outer surface area of the fish tank to be $5\ \text{m}^2$.



i) Show that the volume of the tank, $V\ \text{m}^3$, is given by $V = \frac{2}{5}(5l - 4l^3)$. [3]

ii) Determine the area of the rectangular base for the tank to contain the maximum amount of water when filled to the brim. [4]

4a) Show that $y = \ln\left(\frac{8+3x}{3x-4}\right)$ has no turning point for all values of x. [4]

b) Find the range of values of x in which the graph $y = \ln\left(\frac{8+3x}{3x-4}\right)$ is decreasing. [3]

5) The equation of a curve is $y = \frac{2\sin x}{\cos x - 3}$

a) Express $\frac{dy}{dx}$ in the form $\frac{a + b\cos x}{(\cos x - 3)^2}$, where a and b are constants. [3]

b) Given y is decreasing at 0.064 units per second, find the rate of change of x with respect to time when $x = \frac{\pi}{3}$. [3]

6) Find the derivative of $y = \frac{e^{\frac{1}{x}}}{2x+3}$, and determine whether y is an increasing or decreasing function. [7]