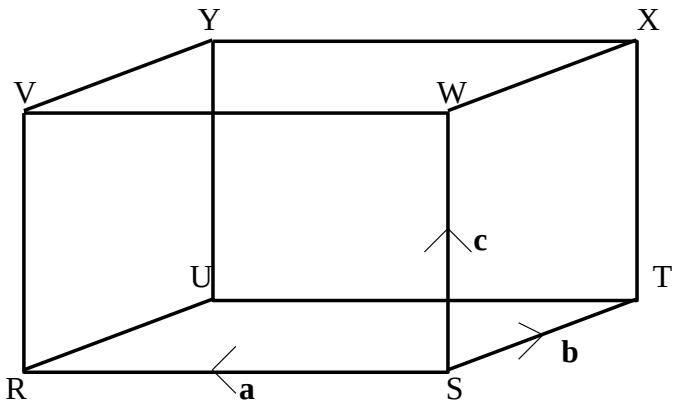
Perth Academy National 5 Applications Homework 16

1. In the diagram below RSTU, VWXY represents a cuboid.
$\overrightarrow{SR}$ represents vector **a**, $\overrightarrow{ST}$ represents vector **b** and $\overrightarrow{SW}$ represents vector **c**.



Express the following vectors in terms of **a** and/or **b** and /or **c**.

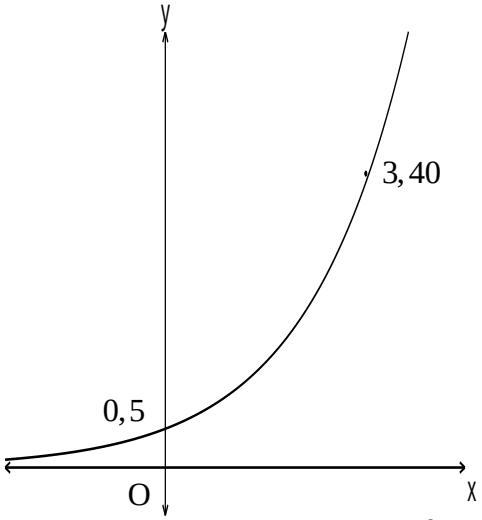
(a) $\overrightarrow{RT}$ (b) $\overrightarrow{UX}$ (c) $\overrightarrow{RX}$ (d) $\overrightarrow{VT}$

2. Solve these trig equations for $0 \leq x \leq 360$.

(a) $4\sin x^\circ + 3 = 0$ (b) $3\tan x^\circ = 2 - 3\sin 231^\circ$

3. Explain, using the quadratic formula, why the equation $x^2 + x + 4 = 0$ has no real solutions.

4. The graph of the function $y = a \times b^x$ is shown below. It passes through the points $0,5$ and $3,40$. Find the values of *a* and *b*.



5. (a) Calculate the mean and standard deviation of the following set of numbers

13 17 21 24 25 26

(b) Use your answers to (a) to **write down** the mean and standard deviation of

113 117 121 124 125 126

6. A tank contains 10 litres of water.
A further 30 litres of water are poured into the tank at a steady rate of 5 litres per minute.

(a) Draw an accurate graph of the volume, V litres, against the time, t minutes.
(b) Write down an equation connecting V and t.

7. The intensity of light, I, emerging after passing through a liquid with concentration, c, is given by the formula $I = \frac{20}{2^c}, \quad c \geq 0$.

(a) Find the intensity of light when the concentration is 3.

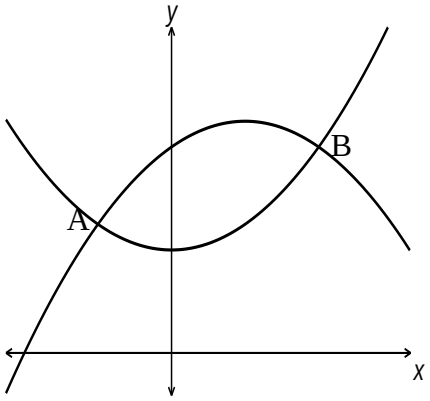
(b) Find the concentration of the liquid when the intensity is 10.

(c) What is the maximum possible intensity?

8. Simplify $\frac{\sqrt{3}}{\sqrt{24}}$, expressing your answer with a rational denominator.

9. (a) $F = f\left(1 - \frac{v}{s}\right)$. Change the subject of this formula to v.
(b) $M = 80 \times 2^{-t}$. draw a graph of M against t for $0 \leq t \leq 5$.
(c) Solve the inequality $2 - 5\ 3x - 2\ \geq 4\ 1 - 3x$

10. The sketch below shows the curves with equations $y = 8 + 2x - x^2$ and $y = x^2 + 4$.



The curves intersect at points A and B.
Find, algebraically, the coordinates of A and B.

11. Mello aftershave is sold in cylindrical cans. The manufacturer wants to change the dimensions of the can to produce a taller, slimmer can.
The height of the can is to be increased by 30%. By what percentage must the radius be reduced if the volume is to remain the same?