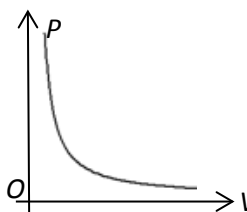
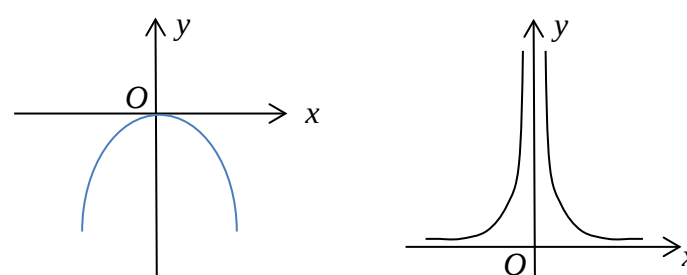


Sec 3 EOY IM1 2018 Answer Key

1(i)	$P = \frac{38}{V}$
(ii)	$V \approx 0.00204 \text{ m}^3$
(iii)	
2(a) (i)& (ii)	
(b)	Any equation of the form (i) $y = ax^3 + 2$, where $a < 0$ (ii) $y = 2a^{kx}$, where $a > 0, k < 0$
3	Perimeter of shaded region $\approx 30.4 \text{ cm}$
4(i)	$a = 0.75, b = 1.5$
(ii)	$x = 0.915, -2.91$
(iii)	The x-intercept is -2
5(i)	$y = -\frac{8}{5}x + \frac{56}{5}$ or $5y + 8x = 56$
(ii)	Since Gradient of $DF \times$ Gradient of $AB = -\frac{8}{7} \neq -1$, DF is not perpendicular to AB .
(iii)	B is $(-4, -4)$
(iv)	C is $(12, -8)$
(v)	Area = 90 sq units
6(i)	$PQ = \begin{pmatrix} 120 & 140 \\ 160 & 120 \end{pmatrix} \begin{pmatrix} 0.25 & 0.3 & 0.45 \\ 0.35 & 0.25 & 0.4 \end{pmatrix}$ $= \begin{pmatrix} 79 & 71 & 110 \\ 82 & 78 & 120 \end{pmatrix}$ The elements in the first row of PQ represent the number of boys who are healthy, ill and carriers respectively. The elements in the second row of PQ represent the number of girls who are healthy, ill and carriers respectively. OR There are 79 boys and 82 girls who are healthy, 71 boys and 78 girls who are sick and 110 boys and 120 girls who are carriers of the disease.

(ii)	$\mathbf{R} = \begin{pmatrix} 10 \\ 25 \\ 15 \end{pmatrix}$ The total medical cost for the boys and girls are \$4215 and \$4570 respectively.
(iii)	The total medical costs incurred is \$7414.
7(i)	$\angle AMF \approx 71.4^\circ \text{ or } 108.6^\circ$
(ii)	Distance student walked $\approx 327\text{m}$ (Accept 328m)
8(a)	Gradient ≈ -7.85 (Accept $-10 \leq m \leq -6.36$)
(b)	$x \approx 2.9$ (Accept $2.8 \leq x \leq 3.1$)
(c)(i)	$0.35 \leq x \leq 2.45$ (Accept 0.35-0.4 for lower bound and 2.4-2.45 for upper bound)
(c)(ii)	$x \approx 0.55 \text{ or } 3$ (Accept 0.55 or 0.6 / 2.95 or 3 or 3.05)
9(a)(i)	angle $BJC = 40^\circ$
(ii)	angle $EBA = 65^\circ$
(iii)	angle $JCE = 25^\circ$
(iv)	angle $BFC = 65^\circ$
(b)	Angles in the same segment
(c)	EB = 3cm since equal arcs in the same circle subtend equal angles at the circumference
10(ii)	Eqn of circle is $(x + 3)^2 + (y - 2)^2 = 25$
(iii)	Centre of circle C_2 is $B(-3, 4)$ Centre of circle C_3 is $C(3, 4)$
(iv)	A circle can be drawn as the three points are not collinear. Since AB is perpendicular to BC , ABC forms a semi-circle as angle in semi-circle = 90° . The centre of circle C_4 is the midpoint of AC . Centre = $(0, 3)$
11(i)	$\angle ABC \approx 54.9^\circ$
(ii)	$PQ \approx 4.05\text{km}$
12	$\angle QPR = \angle SQR$ (alternate segment thm) $\angle PRQ = \angle QRS$ (common angle) $\therefore \Delta QPR$ is similar to ΔSQR $\Rightarrow \frac{QR}{SR} = \frac{PR}{QR}$ $QR^2 = PR \times SR$ $PR^2 - PQ^2 = PR \times SR$ $(PQ \perp QR \text{ since } QR \text{ is a tangent to the circle})$ $\therefore PR^2 = PQ^2 + PR \times SR$ OR $QR^2 = PR \times SR \text{ (tangent-secant theorem)}$ Since QR is a tangent to the circle, $PQ \perp QR$. Using Pythagoras' Theorem, $PR^2 = PQ^2 + QR^2$ $\therefore PR^2 = PQ^2 + PR \times SR$