Yr 10 AT2 2018 Solutions

Q10a) $x^2 - 6x + 3$ $\quad \left(\frac{6}{2}\right)^2 = 9$ ✓

$= (x-3)^2 - 9 + 3$

$= (x-3)^2 - 6$ ✓

b) $g(x) = h(x)$

$2 - 4x = x^2 + 9x + 14$

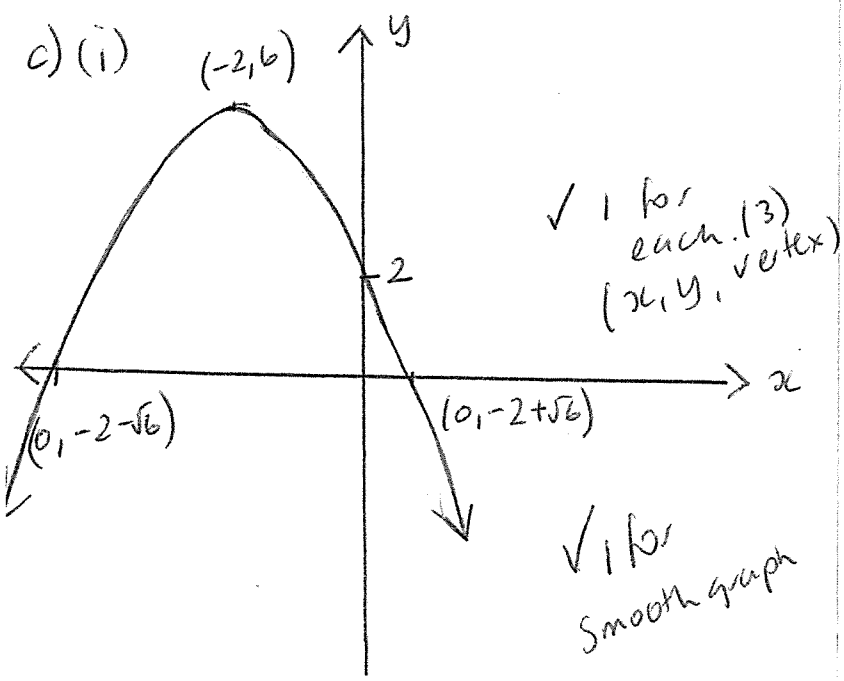
$0 = x^2 + 9x + 4x + 14 - 2$

$0 = x^2 + 13x + 12$ ✓

$0 = (x+12)(x+1)$

$x = -12, -1$ ✓

c) (i)



✓ 1 for each (3) (x, y, vertex)

✓ 1 for Smooth graph

$y = -(x+2)^2 + 6$

x intercepts: $0 = -(x+2)^2 + 6$

$(x+2)^2 = 6$

$x + 2 = \pm\sqrt{6}$

$x = \pm\sqrt{6} - 2$

y intercept: $y = -(0+2)^2 + 6$

$y = -4 + 6$

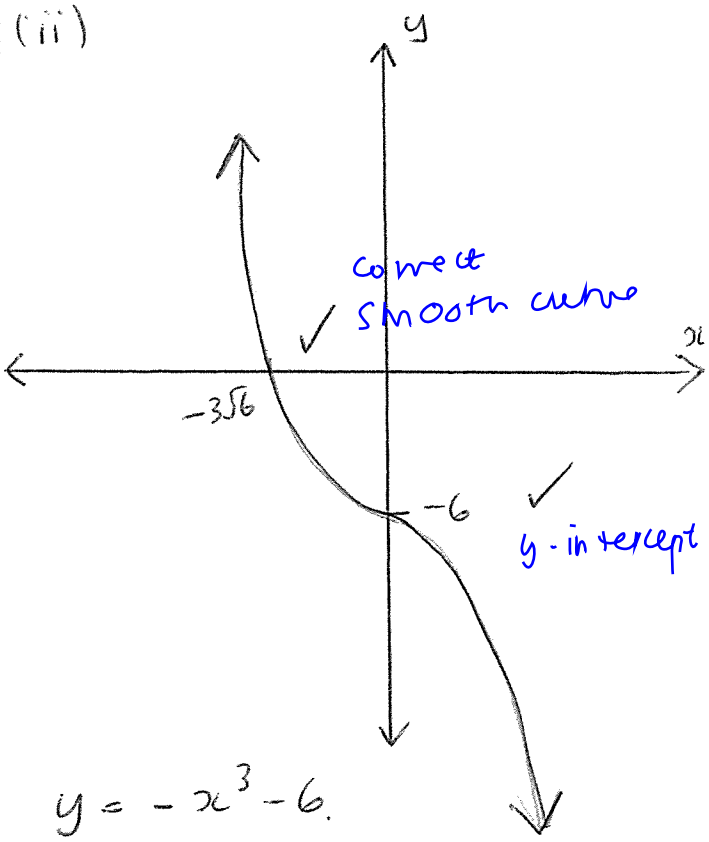
$y = 2.$

vertex $(-2, 6)$

or by equivalent method

(axis of symmetry → y value).

(ii)



correct smooth curve ✓

✓ y-intercept

$y = -x^3 - 6.$

x intercept $\quad 0 = -x^3 - 6$

$x^3 = -6$

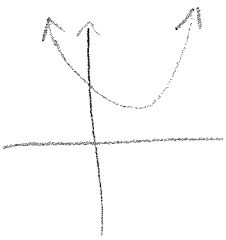
$x = -\sqrt[3]{6}$

y intercept $\quad y = 0 - 6$

$y = -6.$

d)

$y = x^2 - 3x + 3$



Find vertex, sketch, axis of symmetry → y value.

$x = \frac{-b}{2a}$

$x = \frac{3}{2}$

$y = \left(\frac{3}{2}\right)^2 - \left(\frac{3}{2}\right)3 + 3$

$y = \frac{3}{4}$

vertex: $\left(\frac{3}{2}, \frac{3}{4}\right)$

D: $\{x : x \in \mathbb{R}\}$ ✓

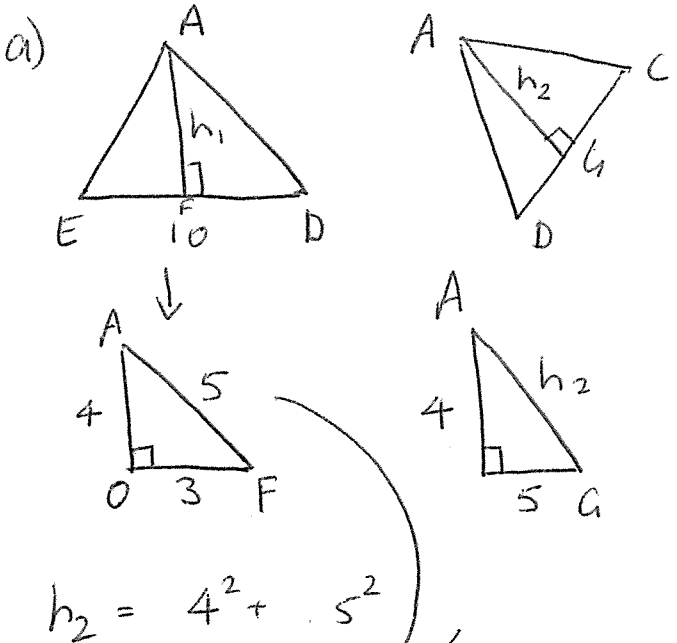
R: $\{y : y \geq 3/4\}$

e) $D: \{x : -3 \leqslant x \leqslant 3\}$ ✓

$R: \{y : -3 \leqslant y \leqslant 3\}$ ✓

Question 11

a)



$h_2 = 4^2 + 5^2$ ✓

$h_2 = \sqrt{41}$

Total surface ✓

$SA = 6 \times 10 + 2\left(\frac{1}{2}(10)(5) + \frac{1}{2}(6)(\sqrt{41})\right)$

$SA = 60 + 2(25 + 3\sqrt{41})$

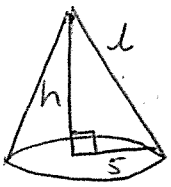
$SA = 60 + 50 + 6\sqrt{41}$

$SA = 124.6969845$ ✓

$SA = 124.7$ ~~148.4~~

① for slant height
① for total correct SA.
① for calculator readout

b)



$SA = 200\pi$

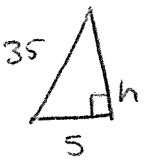
$SA = \pi r l + \pi r^2$

$200\pi = \pi(5l + 25)$ ✓

$200 = 5l + 25$

$l5 = 175$

$l = 35$ ✓



$h^2 = 35^2 - 5^2$

$h^2 = 1200$

$h = \sqrt{1200}$ or $20\sqrt{3}$ ✓

c)

Volume of cone

$V_1 = \frac{1}{3}\pi r^2 h$

$V_1 = \frac{1}{3}\pi \times \left(\frac{17.5}{2}\right)^2 \times 8.5$ ✓

$= 681.496\ldots$

Volume of cylinder

$V_2 = \pi r^2 h_2$

$V_2 = \pi \times \left(\frac{17.5}{2}\right)^2 \times 5.8$ ✓

$= 1395.0634\ldots$

Total Volume

$V = V_1 + V_2$ ✓

$V = 681.496\ldots + 1395.0634\ldots$

$V = 2076.5594$

$V = 2070$ (3 sig fig) ~~2080~~ ✓

d) $\frac{4}{3}\pi r^3 = 100$ ✓

$r = 2.87941\ldots$ or $r = \sqrt[3]{\frac{300}{4\pi}}$ ✓

$\div 2.879$ m or 2879 mm

Question 12

a) $5x + y = 11$ ①

$y = 3 + 5x - 2x^2$ ②

from ① $y = 11 - 5x$ into ②

$11 - 5x = 3 + 5x - 2x^2$ ✓

$2x^2 - 10x + 8 = 0$

$x - 5x + 4 = 0$

$(x-4)(x-1) = 0$

5 $x = 4, +1$

$5(4) + y = 11 \rightarrow y = -9$

$5(+1) + y = 11 \rightarrow y = 6$

$(4, -9)$ $(+1, 6)$

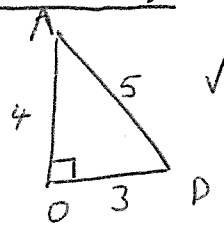
✓ ✓

b) Large cone (no circle)

$SA_1 = \pi r l$

$= \pi \times 3 \times 5$

$= 15\pi$



✓

Circle radius 0·6m

$A = \pi r^2$

$A = \pi \times (0.6)$

$A = 0.36\pi$ ✓

hemisphere (no circle)

radius = 3

$SA_2 = 2\pi r^2$

$SA_2 = 2\pi \times 9$

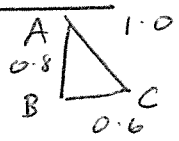
$= 18\pi$ ✓

Small cone (no circle)

$SA_3 = \pi r l$

$= \pi \times 0.6 \times 1$

$= \pi \times 0.6$.



(large - small for 1 mark).

total SA

$SA = SA_1 + S + SA_2 - SA_3$

$= 15\pi + 0.36\pi + 18\pi - 0.6\pi$

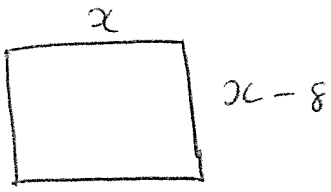
$= \pi(15 + 0.36 + 18 - 0.6)$

$= 32.76\pi$

$= 102.91857533 16$

$= 102.92$ ✓

c)



$x(x-8) = 240$ ✓

$x^2 - 8x - 240 = 0$ ✓ (may use other method)

$(x-20)(x+12) = 0$

$x = 20, -12$ ✓

$x \neq -12 \therefore x = 20$ ✓

needs to discount $x = -12$

d) $A_1 + A_2 = 106\pi \text{ cm}^2$

$A_1 = \pi x^2$

$A_2 = \pi(x+4)^2$

$106\pi = \pi x^2 + \pi(x+4)^2$ ✓

$106 = x^2 + x^2 + 8x + 16$

$106 = 2x^2 + 8x + 8$

d) cont.

$0 = x^2 + 4x - 45$

$0 = (x+9)(x-5)$ ✓

$x = -9, 5$ ✓

$x \neq -9$ < 0. (must discount < 0)

radius: 5 and $5+4=9$. ✓

Answer grid for Section I

Mark answers to Section I by fully blackening the correct circle

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