

**Calculator-assumed Solutions**

11.

(a)

The number of phones she is given to repair for the week.
- (b)

She fixes 23 per day, for 4 days  $23 \times 4 = 92$  phones
- (c)

$\frac{23}{108} = 4.69565$  days  
 $0.69565 \times 8 = 5.5652$  hours  
 5 hours and 34 minutes
- (d)

$T_1 = 155$   $T_2 = 128$   $T_3 = 99$   $T_4 = 68$   
 $T_{n+1} = T_n - (25 + 2n)$   $T_0 = 180$

12.

(a)

$x^2 + y^2 = 4$
- (b)

$\tan \theta = \sqrt{3}$   $\therefore \theta = \frac{3}{\pi}$  radians  
 radius = 2 units
- (c)

$OB = \frac{2}{\pi}$   
 $\cos \frac{3}{\pi} = 4$
- Therefore area of  $\triangle AOB = \frac{1}{2}(4)\sqrt{3} = 2\sqrt{3}$  units<sup>2</sup>

Area of sector =  $\frac{1}{2}r^2\theta = \frac{1}{2}(2)^2\left(\frac{\pi}{3}\right)$

Area of shaded part = triangle – sector =  $\frac{3}{2}$  units<sup>2</sup>

Area of shaded part = triangle – sector =  $2\sqrt{3} - \frac{3}{2}\pi = 1.37$  units<sup>2</sup> (3 sig fig)

✓

✓

✓

[6]

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13. (a) 5.1 seconds ✓  
 $v(t) = -9.8t + 25$   
 (b)  $v(0) = 25$  ✓✓  
 (c) Maximum height is 31.89 m when  $t = 2.55$  sec  
 $\frac{31.89 \times 2}{2.55 \times 2} = 12.5$  m/s ✓✓

[5]

14. (a)  $f(x) = (2 + x)^2 = 4 + 4x + x^2$  ✓  
 $\lim_{h \rightarrow 0} \frac{(2 + x + h)^2 - (2 + x)^2}{h} = 2x + 4$  ✓  
 (b) (i) -7.5 ✓  
 (ii) 18 ✓  
 (c)  $p'(x) = 3x^2 - 3a$  ✓  
 $0 = 3(\sqrt{2})^2 - 3a$  ✓  
 $a = 2$  ✓  
 $-\sqrt{2} = (\sqrt{2})^3 - 3(2)(\sqrt{2}) + b$  ✓  
 $b = 3\sqrt{2}$  ✓

[7]

15. (a)  $3x^2 - \frac{4}{x^2} - 11 = 0$   
 $x = -2$  or  $x = 2$  ✓✓

(b)

		-2		2	
$y'$	+	0	-	0	+
$y$	↑	-	↓	-	↑

✓✓

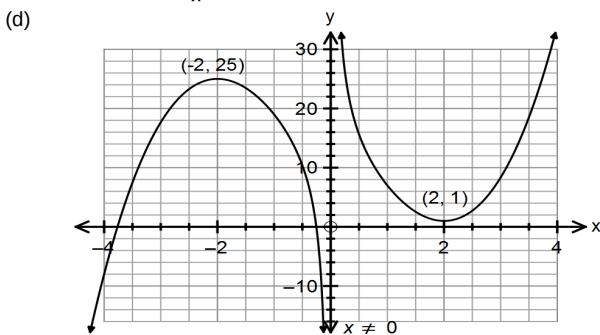
 $x = -2$  Maximum $x = 2$  Minimum

✓

- (c)  $y = x^3 - 11x + \frac{4}{x} + c$  ✓  
 $c = 13$

$$y = x^3 - 11x + \frac{4}{x} + 13$$

✓



✓✓✓

[10]

- $$\begin{array}{ll} 16. & \text{(a)} \quad T_{100} = 23 + (99)(9) = 914 \\ & \text{(ii)} \quad 357980 = \frac{2}{n}(23 + 2534) \\ & \quad n = 280 \\ & \text{(b)} \quad T_{n+1} = 4T_n \\ & \quad T_1 = 12 \\ & \quad S_{\infty} = \frac{1}{1 - \frac{1}{4}} = 16 \end{array} \quad \text{(ii)}$$

17. (a) 92°C (initial temp of tea)  
22°C (room temp)  
(b) After 4.12 mins and before 7.45 mins  
4.12 ≤ t ≤ 7.45  
(c) Horizontal asymptote y = 22  
The tea will cool at a decreasing rate as temperature which is 22°.

18. (a)  $y = \frac{x-3}{2} + 2$   
 (b)  $y = -3\sqrt{x+4}$   
 (c)  $y = \left(\frac{1}{2}\right)^x - 4$

19. (a) 0.2  
(b) 0.5  
(c) 0.3  
(d)  $\Pr(X \cup Y) = \Pr(X) \times \Pr(Y)$  if independent  
 $\Pr(X \cup Y) = \Pr(X) + \Pr(Y) - \Pr(X \cap Y)$   
 $\Pr(X) \times \Pr(Y) = \Pr(X \cap Y)$   
Let  $\Pr(Y) = k$   
 $0.5 + k - 0.8 = 0.5k$   
 $k = 0.6 = \Pr(Y)$

20. (a)  $1, 3, 7, 15, \dots$  (b) 20 sets  
 $T_{n+1} = T_n + 2^n$   
 $T_1 = 1$

21. (a) (i)  $y = 16 - 6 - w$  ✓  
 (ii)  $y^2 = 36 + w^2 - 12w \cos Y$  ✓  
 (iii)  $(10 - w)^2 = 36 + w^2 - 12w \cos Y$  ✓  
 $64 - 20w = -12w \cos Y$  ✓  
 $\therefore \cos Y = \frac{5w - 16}{3w}$
- (b) (i)  $A = \frac{6w \sin Y}{2} = 3w \sin Y$  ✓  
 $A^2 = 9w^2 \sin^2 Y$  ✓  
 (ii)  $9w^2 \sin^2 Y = 9w^2(1 - \cos^2 Y)$  ✓  
 $A^2 = 9w^2 \left( 1 - \left( \frac{5w - 16}{3w} \right)^2 \right)$  ✓  
 $A^2 = \frac{-16w^2 + 160w - 256}{1}$  ✓
- (c) (i)  $A = \sqrt{-16w^2 + 160w - 256}$  ✓  
 $A' = 0$  when  $w = 5$  ✓  
 Maximum area = 12 units<sup>2</sup> ✓  
 (ii)  $y = 10 - w = 5$  ✓  
 The triangle is isosceles. ✓ [12]
22.  $y' = 3x^2 - 12x + k$  ✓  
 $b^2 - 4ac = 0$  for one solution ✓  
 $144 - 4(3)k = 0$  ✓  
 $k = 12$  ✓ [3]
23. (a)  $W = W_0(1.085)^t$  ✓  
 $R = R_0(0.95)^t$  ✓  
 $10W_0 = R_0$  ✓  
 $W_0(1.085)^t = 10 \times W_0(0.95)^t$  ✓  
 $(1.085)^t = 10(0.95)^t$  ✓  
 $t = 17.329$  years ✓  
 After 18 years there will be more wallabies. ✓
- (b)  $W_{n+1} = 1.085 W_n$   $W_0 = 655$  ✓  
 $W_5 = 985$  ✓ [5]
24. (a)  $r = -\frac{3}{2}$  ✓  
 $-2 \left( 1 - \left( -\frac{3}{2} \right)^n \right)$  ✓  
 $\frac{-2 \left( 1 - \left( -\frac{3}{2} \right)^n \right)}{1 - \left( -\frac{3}{2} \right)} = 30$  ✓  
 $n = 9.003$  ✓  
 $\therefore 10$  terms ✓
- (b)  $T_5 = a + 4d$  and  $T_7 = a + 6d$  ✓  
 $\therefore 2a + 10d = 38$  (eq 1) ✓  
 $= 375 = \frac{15}{2}(2a + 14d)$  (eq 2) ✓  
 $a = 4$   $d = 3$  ✓  
 $S_{30} = 15(2(4) + 29(3)) = 1425$  ✓  
 Sum of next 15 terms =  $S_{30} - S_{15} = 1050$  ✓ [7]

25. (a)



- (b) (i) 0.5323 ✓✓✓  
 (ii) 0.2726 ✓  
 (iii) 0.51 ✓  
 (iv) 0.8026 ✓ [7]
26. The particle's initial displacement is 5 m to the right of the origin. ✓  
 $v = 3t^2 - 12t$   $\therefore$  Initial velocity = 0 ✓ [2]