

Answers-Exponentials Review Packet from November Questions

1. (a)

Time (seconds)	0	10	20	30
Number of bacteria	1	2	4	8

(A2) (C2)

Note: Award [½ mark] for each correct entry (round up)

(b) $N = 2^6$

(M1)

Note: Award (M1) for any correct method

$= 64$

(A1) (C2)

[4]

2. (a) \mathbb{R}^+

(A1)

(b) $P(0, 1)$

(A1)

(c) Decreases towards 0 *or* $\rightarrow 0$

(A1)(A1)

Note: Award (A1) for 'Decrease', and (A1) for $\rightarrow 0$.

Marks awarded at examiner's discretion.

[4]

3. (a) Price today = USD 180 000 \times 1.03³

(M1)

= USD 196690.86.....

= USD 196691 or US\$196691 (to the nearest dollar)

(A1) (C2)

Note: Accept equivalent method

(b) $119102 = 100\,000 \times r^3$

$1.19102 = r^3$

(M1)

$r = 1.060001187$

Rate = 6.00% per annum (3 s.f.) (accept 6%)

(A1) (C2)

[4]

4. $c = -10$ (asymptote of graph)

(M1)(A1)

$0 = k(2^1) - 10 \Rightarrow 2k = 10$

(M1)

$\Rightarrow k = 5$

(A1)

OR

$k + c = -5$

(M1)

$2k + c = 0$

(M1)

Therefore, $k = 5$

(A1)

$c = -10$

(A1)

[4]

5. (a) (0,1) (A2)(A2) (C4)
 (b) $16 = a^4$ (M2)
 $a = 2$ (A2) (C4)

[8]

6. (a) The area covered before 7 July (R2) 2
Note: Award (R1) for "area", (R1) for "before" 7 July.

(b) $t = 8 \pm 0.4$ (A1) 1

(c) $100(1.075)^{21}$ (M1)(A1)
 $= 457 \text{ m}^2$ (A1) 3

[6]

Note: Award (M1) for correct formula, (A1) for correct power and (A1) for correct answer.

7. (a) $A = 6000(1.06)^{10}$ (M1)(A1)
 $= 10745 \text{ (AUD)}$ (A1) (C3)

(b) $10745 - 5000$
 $= 5745$ (A1)
 $5000 \times 1.08 + 5745 \times 1.06$ (M1)(M1)
 $= 11489.80$ (A1)
 $= 11490 \text{ (to the nearest AUD)}$ (A1) (C5)

[8]

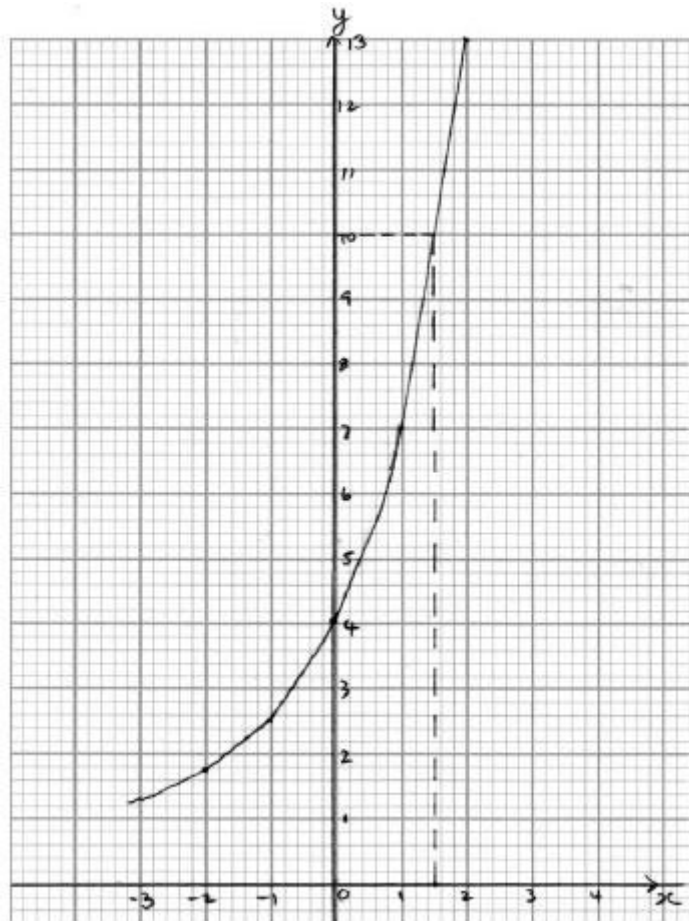
8. (a) 85 ± 1 (M1)(A1) (C2)
 (b) 21.5 ± 0.5 (M1)(A1) (C2)
 (c) $y = 100 \times (5^{-0.02 \times 80})$
 $= 7.61$ (M1)(A1) (C2)
 (d) $y = 0$ (A1)(A1) (C2)

Note: Award (A1) for $y =$ and (A1) for 0.

[8]

9. (a) $600 \left(1 + \frac{2.75}{100}\right)^4 = 668.77$ (accept 669) (M1)(A1)
 OR
 669 (G2) (C2)
- (b) $600 \left(1 + \frac{2.75}{100}\right)^n = 1200$ (M1)
 $n = 25.6$
 $n = 26$ (A1)
 OR
 26 (G2) (C2)
- (c) $600 \left(1 + \frac{r}{100}\right)^{20} = 1200$ (M1)
 $1 + \frac{r}{100} = 1.03526$
 $r = 3.53\%$ (A1)
 OR
 3.53% (G2) (C2)
10. (a) $a = 2.5, b = 13$ (A1)(A1) 2
 (b) (A4) 4

[6]



Note: Award (A1) for scales and labels, (A2) for all points accurate ((A1) for 5 correct), (A1) for smooth curve.

- (c) Range $f(x) > 1$
 $(y > 1)$ (A2) 2

Note: Award (A1) for $f(x) >$, (A1) for 1.

- (d) $x = 1.6 (\pm 0.1)$ (M1)(A1) (or (G2)) 2

Note: Answer by calculation is 1.58.

[10]

11. (a) For attempting to find 5 years by compound interest formula or any alternative method. (M1)
 For using (1.0375) (M1)
 $\$1442.52$ accept 3 s.f. (A1) (G3)

Note: Accept $\$1440$ or $\$1443$.

- (b) For using answer in part (a) in an expression. (M1)
 For multiplying by $(1.0325)^3$ (M1)
 $\$1587.79$ accept $\$1588$ or $\$1590$ (A1) (G3)

[6]

12. (a) $100 + 15 \times 10$ (M1)
 $= 250$ (A1)
OR
 250 (using table function of the GDC) (G2) (C2)

- (b) $100(1.08)^{10}$ (M1)
 $= 215.89$ (A1)
OR
 215.89 (using table function of the GDC) (G2) (C2)

- (c) $100 + 15x = 100(1.08)^x$ (M1)
 After 16 years (A1)

Note: Candidate can use trial and error so not necessary to see the first line to award (A2).

- OR**
 16 years (using table function of the GDC). (G2) (C2)

[6]

13.	(a)	4	(A1) (C1)	
	(b)	For raising to a power of 6.4 28	(M1) (A1) (C2)	
	(c)	$1200 = 4 \times (1.356)^{0.4t}$ (for substituting in the formula) $300 = (1.356)^{0.4t}$ $t = 46.8$ (by trial and error)	(M1) (A1) (A1)	
		OR $t = 46.8$	(G3) (C3)	[6]
14.	(a)	(i) $32\,000r^0 = 32\,000$ <i>Award (M1) for putting $t = 0$.</i>	(M1)(A1) (C2)	
		(ii) $32\,000r = 27\,200$ $r = 0.85$	(M1) (A1) (C2)	
	(b)	$32\,000 \times 0.85^t = 8000$ $0.85^t = 0.25$ $t = 8.53$ (3 s.f.) (accept 9)	(M1) (A1)(ft) (C2)	[6]
15.		<i>Unit penalty (UP) is applicable in part (i)(a)(c)(d)(e) and (f)</i>		
	(a)	90°C	(A1) (UP)	1
	(b)	$y = 16$	(A1)	1
	(c)	16°C (ft) from answer to part (b)	(A1)(ft) (UP)	1
	(d)	25.4°C	(A1) (UP)	1
	(e)	<i>for seeing $2^{0.75}$ or equivalent</i> <i>for multiplying their (d) by their $2^{0.75}$</i> 42.8°C	(A1) (M1) (A1)(ft)(G2) (UP)	3
	(f)	<i>for seeing $20 \times 2^{1.5t} = 100$</i> <i>for seeing a value of t between 1.54 and 1.56 inclusive</i> 1.55 minutes or 92.9 seconds	(A1) (M1)(A1) (A1)(G3) (UP)	4
				[11]