

Topic: Exponential

- 1 (a) Solve the equation $3^{2x+2} - 10(3^x) + 1 = 0$. [4]
- (b) Without using a calculator, evaluate 15^x given that [3]
 $3^{2x-1} \times 5^{4-x} = 3^{x+3} \times 5^{3-2x}$.
- 2 Solve
- (a) $9^x + 2(3^x) = 3^{x+2} - 12$, [4]
- (b) $e^x = 5 + 6e^{-x}$. [3]
- 3 Given that $\frac{9^{n+2} - 3^{2n+2}}{2^5} = 2^a 3^b$, where a and b are integers,
- (i) find the value of a and express b in terms of n , [5]
- (ii) hence, or otherwise, solve the equation $\frac{9^{n+2} - 3^{2n+2}}{2^5} = \frac{1}{4}$. [2]
- 4 Prove that $2^x + \frac{1}{2}(2^{x+4}) - 2^{x+2}$, where x is a positive integer, is exactly [3]
 divisible by 5.
- 5 The quantity, N , of a particle decaying is given by $N = 3500 + 2000e^{-0.04t}$ where t is the time in years after the particle starts decaying.
- (i) Find the quantity of the particle at which the particle has not started [1]
 decaying.
- (ii) Find the quantity of the particle when $t = 14$. [1]
- (iii) Express t in terms of N . [3]
- (iv) Explain why the quantity of the particle can never reach 3500. [1]

Answer Key

1(a)	$x = -2, 0$
1(b)	$\frac{81}{5}$
2(a)	$x = 1, 1.26$
2(b)	1.79
3(i)	$a = -2, b = 2n + 2$
3(ii)	$n = -1$
4	$(2^x)(5)$ is a multiple of 5, hence divisible by 5.
5(i)	5500
5(ii)	4640
5(iii)	$t = -25 \ln \left(\frac{N - 3500}{2000} \right)$
5(iv)	As $t \rightarrow \infty$, $2000e^{-0.04t} \rightarrow 0$, $3500 + 2000e^{-0.04t} \rightarrow 3500$