



Solutions

1.1 Logarithms

1. $x = 2$
2. $x = \frac{-13}{2}$
3. $x = 2$
4. $x = 9$
5. $x = 2$
6. $x = 8$
7. $x = \frac{-1}{2}$
8. $x = 8$
9. $x = 3$
10. $x = 2 \quad x = \frac{3}{2}$
11. $x = 2 \quad y = 1$
12. $x = 3 \quad y = -2$
13. $x = 1 \quad y = 2 \quad \text{or} \quad x = 2 \quad y = 1$
14. $x = 1 \quad y = 3$
15.
 - i. $a + b$
 - ii. $2a + b$
 - iii. $b - a$
 - iv. $a + 2b$
 - v. $2a + 2b$
 - vi. $2b - 3a$
 - vii. $b - \frac{1}{2}a$
 - viii. $\frac{1}{2}b - 3a$
 - ix. $b + 1$
 - x. $2a + b + 1$
 - xi. $1 + a - b$
 - xii. $\frac{1}{3}(a + b + 1)$
16.
 - (a) $x = 5$
 - (b) $x = 4 \quad x = 1$
 - (c) $x = \sqrt{2}$
 - (d) $x = 1 \quad x = 3$
 - (e) $x = 7$
 - (f) $x = \frac{3}{2}$
 - (g) $x = 0.47397$
 - (h) $x = 1396.5$
17.
 - (a) $x = 4 \quad x = 8$
 - (b) $x = 9 \quad x = \frac{1}{3}$
 - (c) $x = 5 \quad x = \frac{1}{125}$
 - (d) $x = \frac{1}{64} \quad x = \frac{1}{16}$
 - (e) $x = 6 \quad x = 36$





1.2 Introduction to Exponential Functions

- 7.76 Billion
 - 11.23 Billion
 - 2040
- 3.97 kg
 - 10 weeks
- €45,961.94
- $Y = 2.5e^{0.3185t}$
 - 8.94 million
 - 2020
- China: $r = .0052117$ India: $r = .01349$
Therefore India has a higher growth rate.
 - 2021
- $N = 500e^{.231049t}$
 - 1587
 - 13 hours

1.5 Exam Questions

- $k = -62.5$
 - $x = 64$

$x(\text{wpm})$	0	10	20	30	40	50	60	70
$t(x)(\text{days})$	0	8	18	29	43	61	87	130

- -
 -
 - Graph
 - 62 wpm
 - 17 days
- 12th day.
 - $S = 1.1$
 - 1813593
 - 190737
 - $k = -0.05$

1.3 Half Life and Carbon Dating

- 96%
 - 66%
 - 1.65%
- 3435 years

1.4 Newtons Law of Cooling

- $T = 25 + 195e^{-0.041895t}$
 - 61 mins
 - 129°C
- 53°C
 - 44°C
- Another 13 mins.





(e) $t = 8.44$ years, 2018

(f) 2743694

(g) -130712

4. (a) i. .

x	0	0.5	1	$\ln(4)$
$f(x) = \frac{2}{e^x}$	2	1.21	0.74	0.5
$g(x) = e^x - 1$	0	0.65	1.72	3

ii. graph

iii. $x = 0.7$

(b) $x = 0.693$

5. i. $3p - q$

ii. $2q + 2 - 4p$

6. (a) $y = 77^\circ\text{C}$, $A = 77$

(b) $k = -0.0339$

(c) 31 minutes.

(d) .

(e) i. .

ii. Suggested value: $m = -0.05$ Reason: This value of m gives a larger average rate of change for the cooling time required.

(f) i. -2.52°C per min, -1.86°C per min.

7. (a) 0.7851 or 78.51%

(b) 8900 years.

8. (a) $A = 2.920$, $b = 0.100$

(b) From the table $Q(2) = 2.391$, thus verifying the values for A and b .

(c) .

(d) $k = 6.93$

