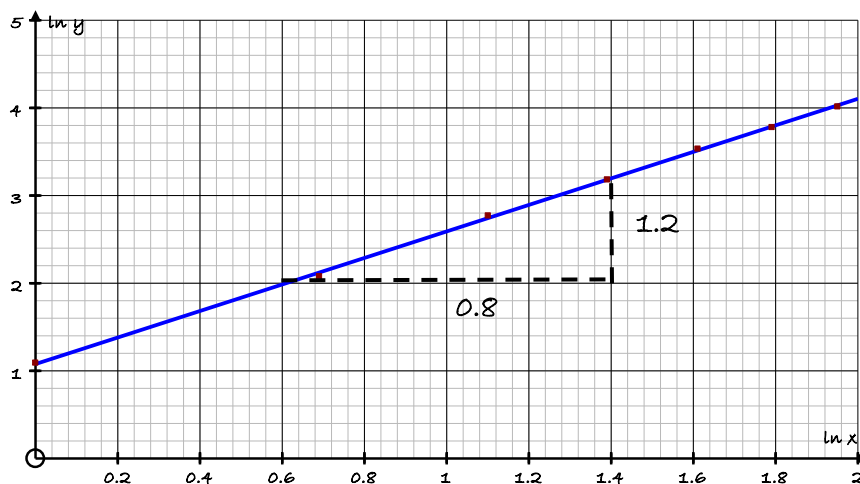


Section 3: Modelling curves

Solutions to Exercise level 2

1. (i)

x	1	2	3	4	5	6	7
y	3	8	16	24	34	44	56
$\ln x$	0	0.69	1.10	1.39	1.61	1.79	1.95
$\ln y$	1.09	2.08	2.77	3.18	3.53	3.78	4.02



$$y = kx^n$$

$$\ln y = \ln k + n \ln x$$

This is the equation of a straight line, with variables $\ln y$ and $\ln x$.

Since the points form an approximate straight line, the model is appropriate.

(ii) $\ln y = \ln k + n \ln x$ is the equation of a straight line with gradient n and intercept $\ln k$.

$$\text{Gradient} = \frac{1.2}{0.8} = 1.5 \Rightarrow n = 1.5$$

$$\text{Intercept} = 1.1 \text{ so } \ln k = 1.1 \Rightarrow k = e^{1.1} \approx 3$$

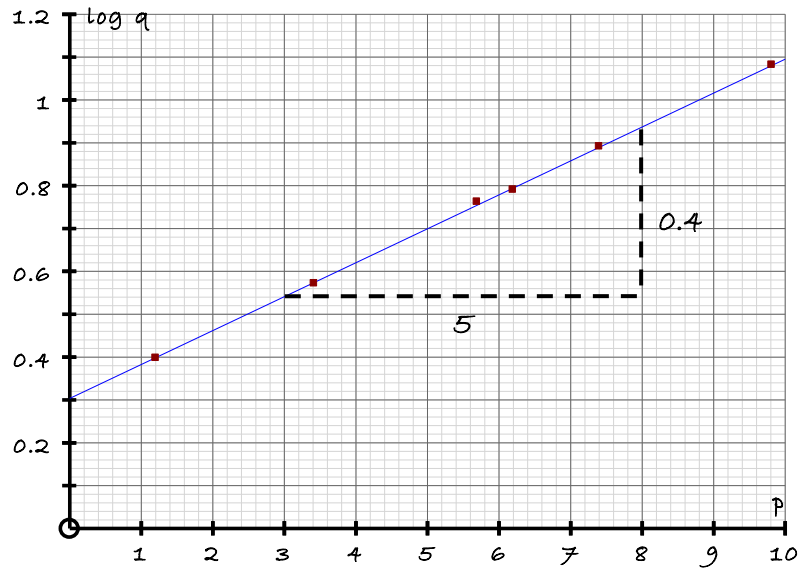
(iii) $y = 3x^{1.5}$

When $x = 10$, $y = 3 \times 10^{1.5} \approx 95$

2. (i)

p	1.2	3.4	5.7	6.2	7.4	9.8
q	2.5	3.7	5.8	6.1	7.7	11.9
$\log q$	0.40	0.57	0.76	0.79	0.89	1.08

Edexcel AS Maths Exponentials and logs 3 Exercise solns



$$q = ab^p$$

$$\log q = \log a + p \log b$$

This is the equation of a straight line, with variables $\log q$ and p .

Since the points form an approximate straight line, the model is appropriate.

(ii) $\log q = \log a + p \log b$ is the equation of a straight line with gradient $\log b$ and intercept $\log a$.

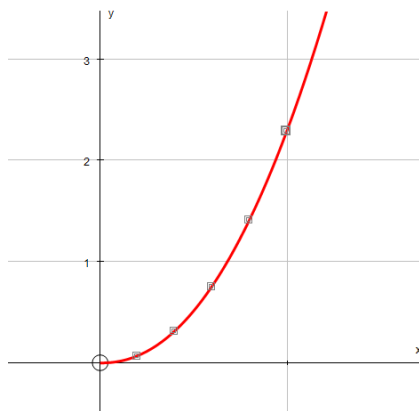
$$\text{Gradient} = \frac{0.4}{5} = 0.08, \text{ so } \log b = 0.08 \Rightarrow b = 10^{0.08} \approx 1.2$$

$$\text{Intercept} = 0.3, \text{ so } \log a = 0.3 \Rightarrow a = 10^{0.3} \approx 2$$

(iii) $q = 2 \times 1.2^p$

When $p = 12$, $q = 2 \times 1.2^{12} \approx 17.8$

3. (i)



The graph appears to be a power curve, so suggest a law of form $y = kx^a$.

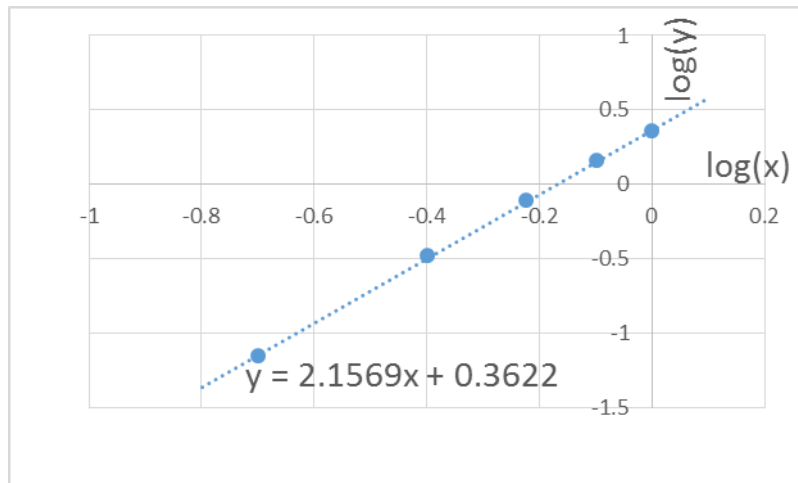
Edexcel AS Maths Exponentials and logs 3 Exercise solns

(ii) $y = kx^a$

$$\Rightarrow \log y = a \log x + \log k$$

so plot a graph of $\log y$ against $\log x$.

Log x	-0.69897	-0.39794	-0.22185	-0.09691	0
Log y	-1.1549	-0.48149	-0.11351	0.155336	0.352183



Gradient $\approx 2.1569 = a$

Intercept $\approx 0.3622 = \log k \Rightarrow k \approx 2.303$

so the law is approximately $y = 2.30x^{2.16}$