

Exponential Functions Review

Answer key Final answers only. Try first, then check.

CORE SKILLS

- K1**
- a) $\frac{9}{8}$
 - b) $\frac{25}{4}$
 - c) $2x^{14}$
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- K2**
- a) 9
 - b) $\frac{1}{8}$
 - c) $\frac{27}{8}$
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- K3**
- a) $x^{5/6}$
 - b) $\frac{a}{b^3}$
 - c) $\frac{y^2}{4x^4}$
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- K4**
- a) $y = 4^x$ and $y = 0.4^x$
 - b) $D = (-\infty, \infty)$, $R = (0, \infty)$; y -intercept 1; asymptote $y = 0$
 - c) Decreasing; $f(-3) = 8$
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- K5**
- a) $g(x) = 2 \cdot 3^{2(x-2)} + 1$; $a = 2$, $k = 2$, $d = 2$, $c = 1$
 - b) $y = 1$; $R = (1, \infty)$
 - c) $\left(\frac{5}{2}, 7\right)$

REAL WORLD

- A1**
- a) $A(t) = 800 \left(\frac{1}{2}\right)^{t/6}$; 50 MBq
 - b) 30 hours
 - c) Never: $A(t) > 0$ for every t , since $A = 0$ is an asymptote. A real dose has a finite number of atoms, so it does run out; the model only works while many atoms remain.
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- A2**
- a) $N(t) = 500(2)^{t/20}$
 - b) 32 000 bacteria
 - c) 12:00 noon ($t = 180$ min)
 - d) $N(1440) = 500 \cdot 2^{72} \approx 2.4 \times 10^{24}$ bacteria, about 2.4×10^{12} g (2.4 million tonnes). Impossible: food and space run out long before, so the growth stops being exponential.
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- A3**
- a) Town A is linear: $P_A(t) = 12\,000 + 600t$. Town B is exponential: $P_B(t) = 8000(1.1)^t$.
 - b) 2028 ($t = 8$: $P_B \approx 17\,149$, $P_A = 16\,800$)
 - c) $P_A(-25) = -3000$ is impossible: the linear model can't be extended that far back (it reaches 0 at $t = -20$). $P_B(-25) \approx 738$ is possible.

THINK IT THROUGH

- T1**
- a) 16, so $x = -64$ is also a solution: 64 is not the only one.
 - b) Raising to $\frac{3}{2}$ hides a square root: $(x^{1/3})^2 = 16$ gives $x^{1/3} = \pm 4$, so $x = \pm 64$.
 - c) $x = \pm 32$; $x^{3/4} = -8$ has no real solution, since $x^{3/4} = (\sqrt[4]{x})^3 \geq 0$.

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- T2** **a)** $a = 2, c = -3$
 b) e.g. $y = -3(2)^x + 4$
 c) e.g. $y = 6\left(\frac{1}{2}\right)^x + 2$

BOSS LEVEL

- Boss** **a)** $x = 1$ or $x = 2$
 b) $x = 2$
 c) $k = 6$
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