

- 11 On the same set of axes, sketch and clearly label the graphs of:

$$f: x \mapsto e^x, \quad g: x \mapsto -e^x, \quad h: x \mapsto 10 - e^x$$

State the domain and range of each function.

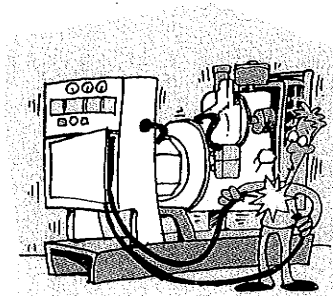
- 12 The weight of bacteria in a culture is given by $W(t) = 2e^{\frac{t}{2}}$ grams where t is the time in hours after the culture was set to grow.

- a What is the weight of the culture at:
 i $t = 0$ ii $t = 30$ min iii $t = 1\frac{1}{2}$ hours iv $t = 6$ hours?
 b Use a to sketch the graph of $W(t) = 2e^{\frac{t}{2}}$.

- 13 The current flowing in an electrical circuit t seconds after it is switched off is given by

$$I(t) = 75e^{-0.15t} \text{ amps.}$$

- a What current is still flowing in the circuit after:
 i $t = 1$ sec ii $t = 10$ sec?
 b Use your graphics calculator to sketch $I(t) = 75e^{-0.15t}$ and $I = 1$.
 c Find how long it would take for the current to fall to 1 amp.



- 14 a Given $f: x \mapsto e^x$, find the defining equation of f^{-1} .
 b Sketch the graphs of $y = e^x$, $y = x$ and $y = f^{-1}(x)$ on the same set of axes.

REVIEW SET 3A

- 1 Simplify: a $-(-1)^{10}$ b $-(-3)^3$ c $3^0 - 3^{-1}$
- 2 Simplify using the index laws:
 a $a^4b^5 \times a^2b^2$ b $6xy^5 \div 9x^2y^5$ c $\frac{5(x^2y)^2}{(5x^2)^2}$
- 3 Write the following as a power of 2:
 a 2×2^{-4} b $16 \div 2^{-3}$ c 8^4
- 4 Write without brackets or negative indices:
 a b^{-3} b $(ab)^{-1}$ c ab^{-1}
- 5 Find the value of x , without using your calculator: a $2^{x-3} = \frac{1}{32}$ b $9^x = 27^{2-2x}$
- 6 Evaluate without using a calculator: a $8^{\frac{2}{3}}$ b $27^{-\frac{2}{3}}$
- 7 Evaluate, correct to 3 significant figures, using your calculator:
 a $3^{\frac{3}{4}}$ b $27^{-\frac{1}{5}}$ c $\sqrt[4]{100}$
- 8 If $f(x) = 3 \times 2^x$, find the value of: a $f(0)$ b $f(3)$ c $f(-2)$
- 9 On the same set of axes draw the graphs of a $y = 2^x$ b $y = 2^x - 4$, stating the y -intercept and the equation of the horizontal asymptote.

- 10 The temperature of a liquid t minutes after it was heated is given by $T = 80 \times (0.913)^t$ °C. Find:
- the initial temperature of the liquid
 - the temperature after i $t = 12$ ii $t = 24$ iii $t = 36$ minutes.
 - Draw the graph of T against t for $t \geq 0$, using the above or technology.
 - Hence, find the time taken for the temperature to reach 25°C.

REVIEW SET 3B

- Simplify: a $-(-2)^3$ b $5^{-1} - 5^0$
- Simplify using the index laws:
 - $(a^7)^3$
 - $pq^2 \times p^3q^4$
 - $\frac{8ab^5}{2a^4b^4}$
- Write as powers of 2: a $\frac{1}{16}$ b $2^x \times 4$ c $4^x \div 8$
- Write without brackets or negative indices:
 - $x^{-2} \times x^{-3}$
 - $2(ab)^{-2}$
 - $2ab^{-2}$
- Solve for x without using a calculator: a $2^{x+1} = 32$ b $4^{x+1} = \left(\frac{1}{8}\right)^x$
- Write as powers of 3: a 81 b 1 c $\frac{1}{27}$ d $\frac{1}{243}$
- Write as a single power of 3: a $\frac{27}{9^a}$ b $(\sqrt{3})^{1-x} \times 9^{1-2x}$
- For $y = 3^x - 5$:
 - find y when $x = 0, \pm 1, \pm 2$
 - discuss y as $x \rightarrow \infty$ and as $x \rightarrow -\infty$
 - sketch the graph of $y = 3^x - 5$
 - state the equation of any asymptote.
- Without using a calculator, solve for x : a $27^x = 3$ b $9^{1-x} = 27^{x+2}$
- On the same set of axes, sketch and clearly label the graphs of:
 $f: x \mapsto e^x$, $g: x \mapsto e^{x-1}$, $h: x \mapsto 3 - e^x$
 State the domain and range of each function.

REVIEW SET 3C

- Write 4×2^n as a power of 2.
 - Evaluate $7^{-1} - 7^0$.
 - Write $\left(\frac{2}{3}\right)^{-3}$ in simplest fractional form.
 - Simplify $\left(\frac{2a^{-1}}{b^2}\right)^2$. Do not have negative indices or brackets in your answer.
- Write 288 as a product of prime numbers in index form.
 - Simplify $\frac{2^{x+1}}{2^{1-x}}$.
- Write as powers of 5 in simplest form:
 - 1
 - $5\sqrt{5}$
 - $\frac{1}{\sqrt[4]{5}}$
 - 25^{a+3}

4 Simplify:

a $-(-2)^2$

b $(-\frac{1}{2}a^{-3})^2$

c $(-3b^{-1})^{-3}$

5 Expand and simplify:

a $e^x(e^{-x} + e^x)$

b $(2^x + 5)^2$

c $(x^{\frac{1}{2}} - 7)(x^{\frac{1}{2}} + 7)$

6 Expand and simplify:

a $(3 - 2^a)^2$

b $(\sqrt{x} + 2)(\sqrt{x} - 2)$

c $2^{-x}(2^{2x} + 2^x)$

7 Solve for x : a $6 \times 2^x = 192$ b $4 \times (\frac{1}{3})^x = 324$

8 The weight of a radioactive substance after t years is given by $W = 1500 \times (0.993)^t$ grams.

a Find the original amount of radioactive material.

b Find the amount of radioactive material remaining after:

i 400 years

ii 800 years.

c Sketch the graph of W against t , $t \geq 0$, using the above or technology.

d Hence, find the time taken for the weight to reduce to 100 grams.

9 If $4^a 2^b = 1$ and $\frac{8^a}{4^b} = \frac{1}{128}$, find $\frac{16^a}{2^b}$.

10 For $y = 2e^{-x} + 1$:

a find y when $x = 0, \pm 1, \pm 2$.

b discuss y as $x \rightarrow \infty$ and as $x \rightarrow -\infty$

c sketch the graph of $y = 2e^{-x} + 1$

d state the equation of any asymptote.