

# Exercise 3E

#1. f)  $2^x = \sqrt{2}$   
 $2^x = 2^{1/2}$   
 $x = 1/2$

↳  $5^{1-2x} = \frac{1}{5}$   
 $5^{1-2x} = 5^{-1}$   
 $1-2x = -1$   
 $-2x = -2$   
 $x = 1$

#2 g)  $4^{x+2} = 128$   
 $(2^2)^{x+2} = 2^7$   
 $2^{2x+4} = 2^7$   
 $2x+4 = 7$   
 $2x = 3$   
 $x = \frac{3}{2}$

i)  $4^{4x-1} = \frac{1}{2}$   
 $(2^2)^{4x-1} = 2^{-1}$   
 $2^{8x-2} = 2^{-1}$   
 $8x-2 = -1$   
 $8x = 1$   
 $x = \frac{1}{8}$

k)  $(\frac{1}{2})^{x+1} = 8$   
 $(2^{-1})^{x+1} = 2^3$   
 $2^{-x-1} = 2^3$   
 $-x-1 = 3$   
 $-x = 4$   
 $x = -4$

#3 a)  $4^{2x+1} = 8^{1-x}$   
 $(2^2)^{2x+1} = (2^3)^{1-x}$   
 $2^{4x+2} = 2^{3-3x}$   
 $4x+2 = 3-3x$   
 $7x = 1$   
 $x = \frac{1}{7}$

b)  $9^{2-x} = (\frac{1}{3})^{2x+1}$   
 $(3^2)^{2-x} = (3^{-1})^{2x+1}$   
 $3^{6-3x} = 3^{-2x-1}$   
 $6-3x = -2x-1$   
 $-x = -7$   
 $x = 7$

$$\#5 \quad a) \quad 4^x - 6(2^x) + 8 = 0$$

$$(2^x)^2 - 6(2^x) + 8 = 0$$

$$\text{Let } W = 2^x \quad W^2 - 6W + 8 = 0$$

$$(W-4)(W-2) = 0$$

$$(2^x - 4)(2^x - 2) = 0$$

$$2^x - 4 = 0 \quad 2^x - 2 = 0$$

$$2^x = 4 \quad 2^x = 2$$

$$\boxed{x = 2} \quad \boxed{x = 1}$$

$$b) \quad 4^x - 2^x - 2 = 0$$

$$(2^x)^2 - 2^x - 2 = 0$$

$$\text{Let } W = 2^x \quad W^2 - W - 2 = 0$$

$$(W-2)(W+1) = 0$$

$$(2^x - 2)(2^x + 1) = 0$$

$$2^x - 2 = 0 \quad 2^x + 1 = 0$$

$$2^x = 2 \quad 2^x = -1$$

$$\boxed{x = 1} \quad \text{not possible}$$

$$d) \quad 9^x = 3^x + 6$$

$$9^x - 3^x - 6 = 0$$

$$(3^x)^2 - 3^x - 6 = 0$$

$$\text{Let } W = 3^x \quad W^2 - W - 6 = 0$$

$$(W-3)(W+2) = 0$$

$$(3^x - 3)(3^x + 2) = 0$$

$$3^x - 3 = 0 \quad 3^x + 2 = 0$$

$$3^x = 3 \quad 3^x = -2$$

$$\boxed{x = 1} \quad \text{not possible}$$

## Exercise 3 G.1

- #1 a. let  $t=0$ ;  $W = 100 (2^{0.1(0)}) = 100$  grams  
b. i.  $100 (2^{.4}) = 132$  grams \* 3 sig figs for IB \*  
ii.  $100 (2^1) = 200$  grams  
iii.  $100 (2^{2.4}) = 528$  grams  
c. omit, for now

- #2 a.  $P_0 = 50$  (initial population)  
b. i.  $50 (2^{.6}) = 75$  possums  
ii.  $50 (2^{1.5}) = 141$  possums  
iii.  $50 (2^3) = 400$  possums

- #3 a.  $B_0 =$  initial population = 12 (6 pairs)  
b.  $2018 \Rightarrow t=20$   $B = 12 (2^{(.18)(20)}) = 145$  bears  
c.  $2008 \Rightarrow t=10$   $B = 12 (2^{(.18)(10)}) = 41$  bears  
 $100 \times \frac{145-41}{41} = 254\%$  increase

## Exercise 3 G.2

- #1 a. 250  
b. i.  $250 (.998)^{400} = 112$  grams  
ii.  $250 (.998)^{800} = 50.4$  grams  
iii.  $250 (.998)^{1200} = 22.6$  grams  
d. 346 years

- #2 a.  $100^\circ\text{C}$   
b. i.  $100 (2^{-.3}) = 81.2^\circ\text{C}$   
ii.  $100 (2^{-.4}) = 75.8^\circ\text{C}$   
iii.  $100 (2^{-1.56}) = 33.9^\circ\text{C}$

#4

a. 1000 grams

b. i.  $1000(2^{-3}) = 812$  grams

ii.  $1000(2^{-3}) = 125$  grams

iii.  $1000(2^{-30}) = \frac{1000}{1073741824}$  gram (a REALLY small #!)