

# Chapter 8 BLM Answers

## BLM 8-1 Prerequisite Skills

1. Each is a root of a negative number. However, only  $\sqrt[3]{-27} = -3$  can be evaluated because  $\sqrt{-9}$  is not a real number.

2. a) 2 and 3; closer to 3    b) 11 and 12; closer to 11

c) 2 and 3; closer to 2    d) 4 and 5; closer to 5

3. Example: any rational number between 64 and 81

4. a) base: 3; exponent: 4;  $3^4 = 81$     b) base: -4;

exponent: 5;  $(-4)^5 = -1024$     c) base:  $x$ ; exponent: 7

d) base:  $3x$ ; exponent:  $\frac{1}{2}$

e) base: 13; exponent: 1;  $13^1 = 13$

f) base:  $\frac{2}{3}$ ; exponent: -3;  $\left(\frac{2}{3}\right)^{-3} = 3.375$

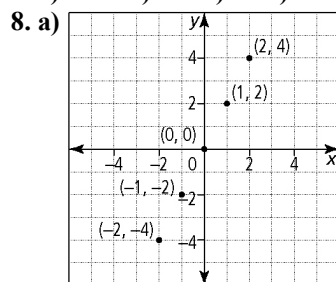
g) base: 1.78; exponent: 2.1;  $1.78^{2.1} \approx 3.3564$

5. a) 14    b) 16    c) 21    d) 15    e) 31    f) 17

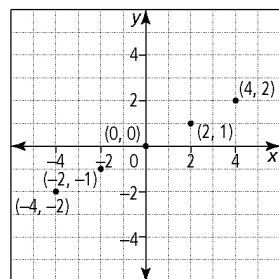
6. a)  $(-4)^6 = 4096$     b)  $21^4 = 194\,481$

c)  $\frac{5^4}{6^4} = \frac{625}{1296}$     d)  $-12^3 = -1728$

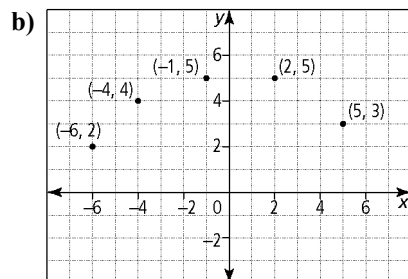
7. a) -11    b) 58    c) 1    d) 44



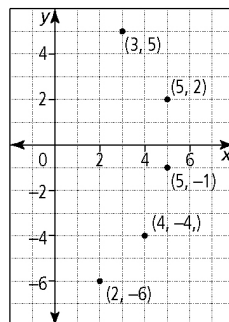
domain:  $\{x \mid x = -2, -1, 0, 1, 2\}$



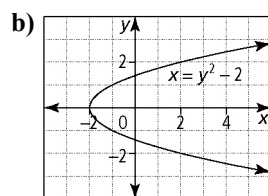
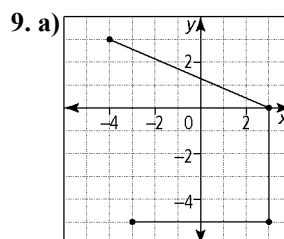
domain:  $\{x \mid x = -4, -2, 0, 2, 4\}$



domain:  $\{x \mid x = -6, -4, -1, 2, 5\}$



domain:  $\{x \mid x = 2, 3, 4, 5\}$

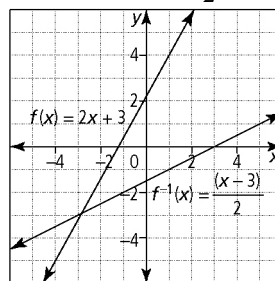


10. a)  $f^{-1}(x) = \frac{x}{3}$     b)  $f^{-1}(x) = \frac{4-x}{3}$

c)  $f^{-1}(x) = 3x - 4$     d)  $f^{-1}(x) = 3x + 15$

e)  $f^{-1}(x) = 0.4(1-x)$     f)  $f^{-1}(x) = 2x - 6$

11. a)  $f^{-1}(x) = \frac{(x-3)}{2}$

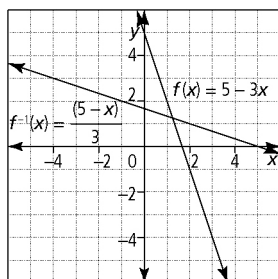


$f(x)$ -domain:  $\{x \mid x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$

$f^{-1}(x)$ -domain:  $\{x \mid x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$

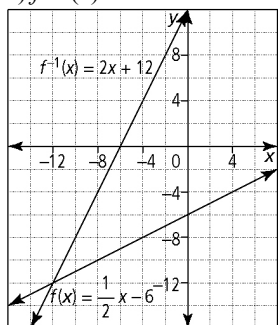
b)  $f^{-1}(x) = \frac{(5-x)}{3}$





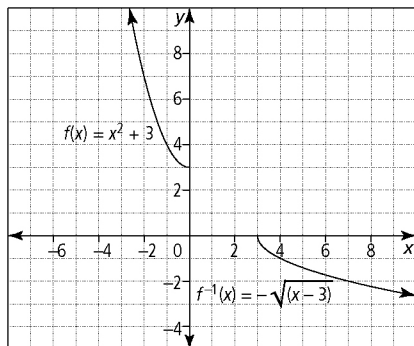
$f(x)$ -domain:  $\{x \mid x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$   
 $f^{-1}(x)$ -domain:  $\{x \mid x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$

c)  $f^{-1}(x) = 2x + 12$



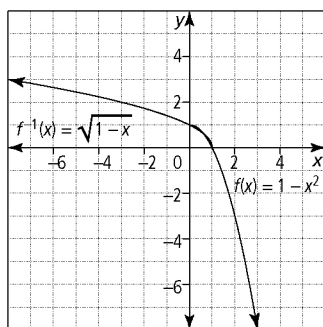
$f(x)$ -domain:  $\{x \mid x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$   
 $f^{-1}(x)$ -domain:  $\{x \mid x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$

d)  $f^{-1}(x) = \sqrt{x-3}$



$f(x)$ -domain:  $\{x \mid x \leq 0, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \geq 3, y \in \mathbb{R}\}$   
 $f^{-1}(x)$ -domain:  $\{x \mid x \geq 3, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \leq 0, y \in \mathbb{R}\}$

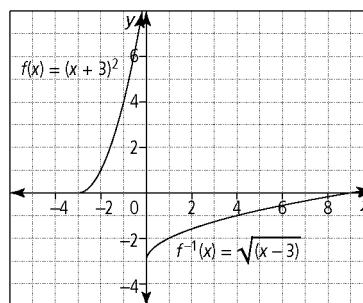
e)  $f^{-1}(x) = \sqrt{1-x}$



$f(x)$ -domain:  $\{x \mid x \geq 0, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \leq 1, y \in \mathbb{R}\}$

$f^{-1}(x)$ -domain:  $\{x \mid x \leq 1, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \geq 0, y \in \mathbb{R}\}$

f)  $f^{-1}(x) = \sqrt{x} - 3$



$f(x)$ -domain:  $\{x \mid x \geq -3, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \geq 0, y \in \mathbb{R}\}$

$f^{-1}(x)$ -domain:  $\{x \mid x \geq 0, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \geq -3, y \in \mathbb{R}\}$

### BLM 8-2 Section 8.1 Extra Practice

1. a) 2 b) 3 c) 3 d) 4 e) 0 f)  $\frac{1}{2}$  g) -2 h)  $\frac{3}{5}$

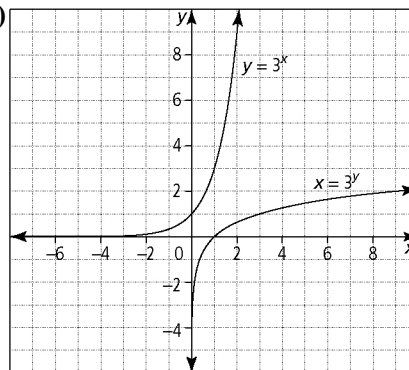
2. a)  $\log_3 243 = 5$  b)  $\log_{16} 2 = \frac{1}{4}$  c)  $\log_2 0.25 = -2$

d)  $\log_5 (n+4) = 2m$

3. a)  $4^3 = 64$  b)  $4^{\frac{3}{2}} = 8$  c)  $10^4 = 10\,000$  d)  $6^y = x - 2$

4. a) 16 b)  $\frac{1}{5}$  c) 3 d) 8

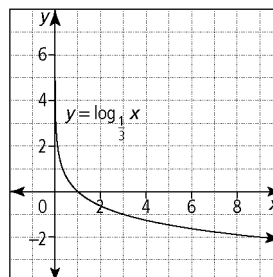
5. a), b)



c) Example: They are reflections of each other over the line  $y = x$ . Each point on the graph of one function  $(x, y)$  appears as the point  $(y, x)$  on the other graph.

6. a)  $y = \log_{\frac{1}{3}} x$

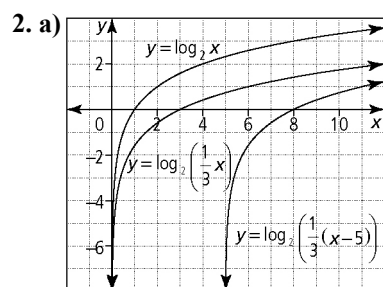
b)



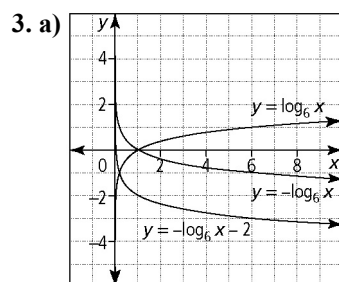
- c) domain:  $\{x \mid x > 0, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$ ;  
 x-intercept: (1, 0); y-intercept: none  
 d) vertical asymptote at  $x = 0$   
 7. a) domain:  $\{x \mid x > 0, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$ ;  
 x-intercept: (1, 0); y-intercept: none; vertical  
 asymptote at  $x = 0$   
 b) domain:  $\{x \mid x > 0, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$ ;  
 x-intercept: (1, 0); y-intercept: none; vertical  
 asymptote at  $x = 0$   
 8. a) 5.9 b) 3.1 c) 2.7 d) 1.5  
 9. a) (4, 0) b) no y-intercept  
 10.  $k = 6$

### BLM 8-3 Section 8.2 Extra Practice

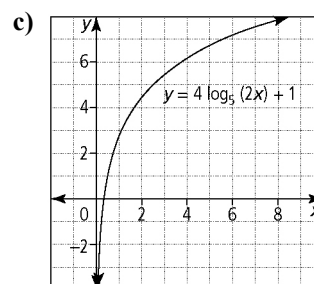
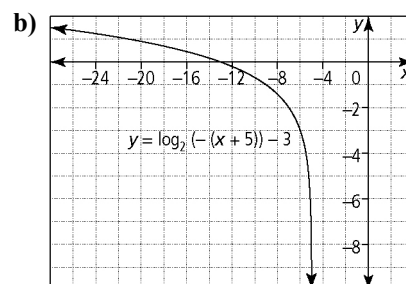
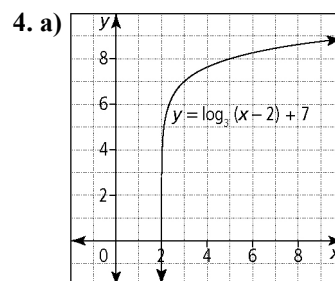
1. a) translation horizontally 8 units left and  
 vertically 1 unit down  
 b) reflection in the y-axis, stretch horizontally about  
 the y-axis by a factor of  $\frac{1}{3}$   
 c) reflection in the x-axis, stretch vertically about the  
 x-axis by a factor of  $\frac{1}{2}$ , translation horizontally 10  
 units right and vertically 9 units up



b)  $y = \log_2 \left( \frac{1}{3} (x - 5) \right)$



b)  $y = -\log_6 x + 2$



5. a) equation of asymptote:  $x = 0$ ;  
 domain:  $\{x \mid x > 0, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$ ;  
 y-intercept: none; x-intercept:  $\left( -\frac{1}{125}, 0 \right)$   
 b) equation of asymptote:  $x = 4$ ;  
 domain:  $\{x \mid x > 4, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$ ;  
 y-intercept: none; x-intercept: (4.5, 0)  
 c) equation of asymptote:  $x = -2$ ;  
 domain:  $\{x \mid x > -2, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$ ;  
 y-intercept: (0, -2.4); x-intercept: (-1.4, 0)  
 d) equation of asymptote:  $x = 10$ ;  
 domain:  $\{x \mid x > 10, x \in \mathbb{R}\}$ ; range:  $\{y \mid y \in \mathbb{R}\}$ ;  
 y-intercept: none; x-intercept: (12, 0)  
 6. a)  $y = \log_4 \left( \frac{1}{4} x \right)$  or  $y = \log_4 x - 1$  b)  $y = -3 \log_2 x$   
 c)  $y = \log_3 (-2x)$  d)  $y = -4 \log_4 x$   
 7. a) a vertical stretch about the x-axis by a factor of  
 2, a horizontal stretch about the y-axis by a factor of  
 $\frac{1}{5}$ , a reflection in the x-axis, and a translation 4 units  
 right and 7 units up  
 b) a vertical stretch about the x-axis by a factor of  
 0.2, a reflection in the y-axis, and a translation 1 unit  
 left and 3 units down



8. a)  $a = 1; b = -1; h = 5; k = -2; y = \log_2(-(x-5)) - 2$

b)  $a = \frac{1}{2}; b = 0.25; h = 0; k = 0; y = \frac{1}{2} \log_2(0.25x)$

c)  $a = -\frac{2}{5}; b = 3; h = -7; k = 2;$

$y = -\frac{2}{5} \log_2(3(x+7)) + 2$

9. a) a vertical stretch about the  $x$ -axis by a factor of 5, a horizontal stretch about the  $y$ -axis by a factor of  $\frac{1}{3}$ , a reflection in the  $y$ -axis, and translation 5

units right and 7 units down

b) a vertical stretch about the  $x$ -axis by a factor of 0.25, a reflection in the  $y$ -axis, and translation 2 units right and 5 units up

c) a vertical stretch about the  $x$ -axis by a factor of  $\frac{1}{2}$  and translation 1 unit left and 7 units up

10. a)  $y = \log_4(x+10)$  b)  $y \approx 19.02 \log_3 x$

### BLM 8-4 Section 8.3 Extra Practice

1. a)  $2 \log_7 x + \log_7 y - \log_7 z$

b)  $\log_3 x + \frac{1}{2} \log_3 y + \frac{1}{2} \log_3 z$

c)  $3 \log_5 x + 3 \log_5 y + 3 \log_5 z$

d)  $\log_2 x + \log_2 y + \frac{1}{3} \log_2 z$

2. a)  $\log_8 512 = 3$  b)  $\log_2 8 = 3$

c)  $\log_5 5^{2.5} = 2.5$  d)  $\log 1 = 0$

3. a)  $\log_4 \left( \frac{x}{y^2} \right)$  b)  $\log_6 \left( \frac{x}{y^3 z^4} \right)$

c)  $\log_4 \sqrt[4]{\frac{x}{y}}$  d)  $\log \left( \frac{100x^3}{y} \right)$

4. a) 23 b) 11 c) 7 d) -14

5. a) 25 b) 16

6. a)  $4k$  b)  $1+k$  c)  $2k+3$  d)  $0.25k-2$

7. a)  $\log_3 x^{\frac{11}{4}}, x \neq 0$  b)  $\log_3 x^{\frac{7}{5}}, x \neq 0$

8. 7.6

9. 100 000 times more

10. 8.1

### BLM 8-5 Section 8.4 Extra Practice

1. a) no solution b)  $\pm\sqrt{29}$  c) -3

2. a) 8 b) 2 c) -3

3. a) 1.79 b) 1.01 c) 13.6

4. a) -1.76 b) -1.81 c) -9.32

5. Example: If Nicole's work is preferred it is because it uses the definition of logarithm to convert 5 into  $\log_2 32$ . Once this is done, the logarithm can be dropped from both sides of the equation. If Joseph's work is preferred, it is because it converts the logarithmic equation into an exponential function.

6. Example: Samuel's error occurs in his first calculation:  $\log 500$  divided by  $\log 5$  does not equal  $\log 100$ . To solve the equation correctly, Samuel should first calculate the log of 500 and then divide this value by the log of 5.

$$\frac{\log 500}{\log 5} = x$$

$$\frac{2.69897...}{0.69897...} = x$$

$$x \approx 3.86$$

7. a) 2.59 b) 8 c) no solution d) 6

8. a) 23.4 compounding periods, so 11.7 years

b) 63.3 compounding periods, so 31.7 years

9.  $b \approx 4.29$

10. 1.94 m

### BLM 8-7 Chapter 8 Test

1. B

2. A

3. D

4. A

5. A

6. A

7.  $x+3$

8. a)  $\frac{1}{64}$  b) 512 c) 25 d) -4, 2 e) 2

9. a) 3.5 b) no solution c) 8

10. 0.6

11. 2.89

12. a) horizontal stretch by a factor of  $\frac{1}{9}$  about the  $y$ -axis

b) vertical translation 2 units up

c)  $x$ -intercept of  $f(x)$  is 1; the  $x$ -intercept of  $g(x)$  is  $\frac{1}{9}$ , since

$g(x)$  is a result of a horizontal stretch by a factor of  $\frac{1}{9}$

13. vertical stretch by a factor of  $\frac{1}{2}$  about the  $x$ -axis,

a horizontal stretch by a factor of  $\frac{1}{3}$  about the  $y$ -axis,

a horizontal translation  $\frac{1}{3}$  units right, and a vertical translation 1 unit up



14. a)  $x = -1$  b) domain:  $\{x \mid x > -1, x \in \mathbb{R}\}$ ; range:

$\{y \mid y \in \mathbb{R}\}$  c)  $x = -\frac{7}{8}, y = 3$

15. 140 months

16. 53.8 days

### BLM U3-2 Unit 3 Test

1. A

2. A

3. D

4. B

5. C

6. D

7.  $a = 3, k = 1.5$

8. 1

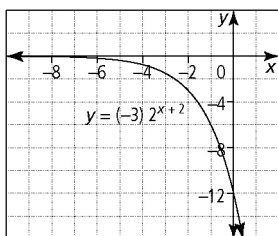
9. 27

10. 9

11. 1

12. a)  $y = (-3) 2^{x+2}$

b)



domain:  $\{x \mid x \in \mathbb{R}\}$ ; range:  $\{y \mid y < 0, y \in \mathbb{R}\}$ ;

no x-intercept; y-intercept = -12

13. (0.83, 0.83) and (1, 1); Example: The two functions are inverses of each other. The points of intersection lie on the line  $y = x$ , the line of reflection.

14. a) 6 b) 7 c) 3

15. a)  $y = x^2 - 1, x > 0$  b)  $y = \frac{x+1}{2(x-1)}, x > 1$

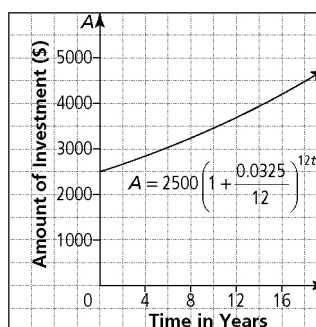
c)  $y = 0.1(x - 3), \{x \mid x > 3, x \in \mathbb{R}\}$

16. a)  $P(t) = 906 \times 1.027^t$  b) 2.7% c) 2015

17. a)  $6.3 \times 10^{-7}$  moles per litre b) 5.5

18. a)  $A = 2500 \left( 1 + \frac{0.0325}{12} \right)^{12t}$

b)



domain:  $\{t \mid t \geq 0, t \in \mathbb{R}\}$ ; range:  $\{A \mid A \geq 2500, A \in \mathbb{R}\}$ ;

no x-intercept; y-intercept = 2500

c) 22 years

