

## Lesson 3A.1:

- 1) Simplify

$$\frac{81x^7(y^2 \cdot \sqrt[3]{z^5})^3}{3x^{-2}y^3z^5}.$$

Express your answer using only positive exponents.

- 2) Express

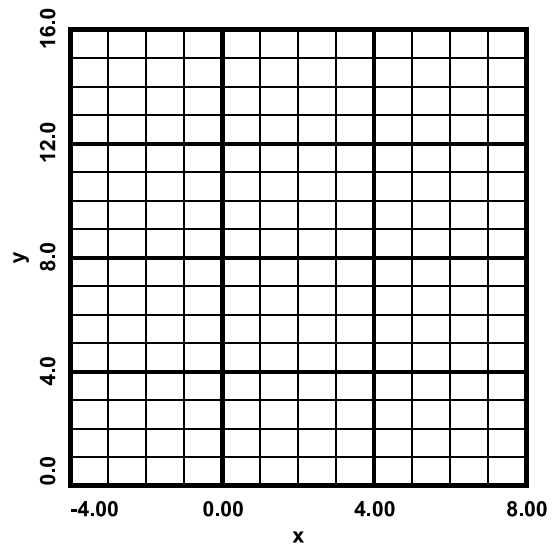
$$\frac{\sqrt[8]{x}}{\sqrt[4]{x^3}}$$

as a single radical.

## Lesson 3A.2:

- 3) Let  $y = f(x) = 2^x$ ,  $y = g(x) = 2^{x-4}$   
and  $y = h(x) = 2^{x+4}$ .

- Describe the translation that takes  $y = f(x)$  to  $y = g(x)$ .
- Describe the translation that takes  $y = f(x)$  to  $y = h(x)$ .
- Express  $y = g(x)$  as a vertical compression of  $y = f(x)$ . Describe the compression in words.
- Express  $y = h(x)$  as a vertical stretch of  $y = f(x)$ . Describe the stretch in words.
- Graph  $y = f(x)$ ,  $y = g(x)$  and  $y = h(x)$  on the axes below. On the graph indicate the translations, compression and stretch of  $y = f(x)$ .



- 4) Let  $y = f(x) = 25^x$ .

- Express  $y = g(x) = 5^x$  as a horizontal stretch of  $y = f(x)$ . Describe the stretch in words.
- Express  $y = h(x) = 625^x$  as a horizontal compression of  $y = f(x)$ . Describe the compression in words.

## Lesson 3A.3:

- 5) For each table, state whether the function represented is linear, quadratic, exponential or logarithmic. Justify your answers.

a)

$x$	$y = y(x)$
-1	$0.\bar{3}$
0	1
1	3
2	9
3	27

b)

$x$	$y = y(x)$
0	8
1	13
2	18
3	23
4	28

c)

$x$	$y = y(x)$
$0.\bar{3}$	-1
1	0
3	1
9	2
27	3

d)

$x$	$y = y(x)$
3	2
4	-1
5	-2
6	-1
7	2

## Lesson 3A.4:

- 6) Apply the Power Rule to  $\log_{21} \sqrt[13]{x^8}$ .
- 7) Calculate  $\log_9 53$  by using the Change of Base Formula with
- a) common logarithms
  - b) natural logarithms

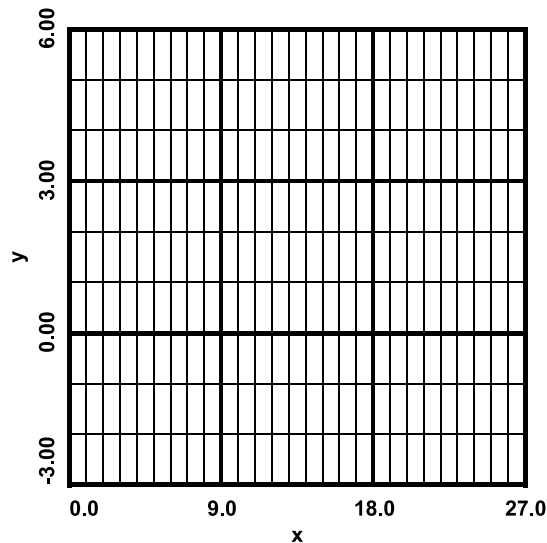
## Lesson 3A.5:

- 8) Express  $3 \log_4 x - 7 \log_4 y - 9 \log_4 z$  as a single logarithm.
- 9) Expand

$$\log_6 \sqrt[7]{\frac{x^5}{y^3 z^2}}.$$

Lesson 3A.6:

- 10) Let  $y = f(x) = \log_3 x$ ,  
 $y = g(x) = \log_3 x + 3$   
 $y = h(x) = \log_3 x - 3$ .
- Describe the translation that takes  $y = f(x)$  to  $y = g(x)$ .
  - Describe the translation that takes  $y = f(x)$  to  $y = h(x)$ .
  - Express  $y = g(x)$  as a horizontal compression of  $y = f(x)$ . Describe the compression in words.
  - Express  $y = h(x)$  as a horizontal stretch of  $y = f(x)$ . Describe the stretch in words.
  - Graph  $y = f(x)$ ,  $y = g(x)$  and  $y = h(x)$  on the axes below. On the graph indicate the translations, compression and stretch of  $y = f(x)$ .

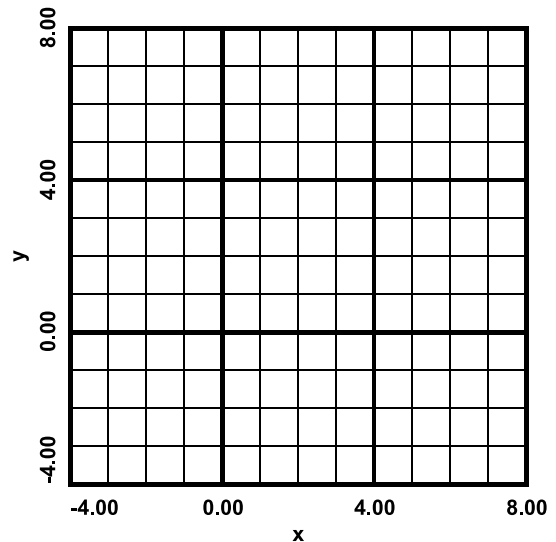


- 11) Let  $y = f(x) = \log_6 x$ .

- Express  $y = g(x) = \log_6 x^4$  as a vertical stretch of  $y = f(x)$ . Describe the stretch in words.
- Express  $y = h(x) = \log_6 \sqrt[4]{x}$  as a vertical compression of  $y = f(x)$ . Describe the compression in words.

- 12) Let  $y = f(x) = 2 \log_2(x - 4) + 3$ .

- Graph  $y = x$  on the axes below.
- Graph  $y = f(x)$  and its vertical asymptote (V.A.) on the axes.
- Calculate  $y = f^{-1}(x)$ .
- Graph  $y = f^{-1}(x)$  and its horizontal asymptote (H.A.) on the axes.
- For  $y = f(x)$  and  $y = f^{-1}(x)$ , state the domain and range.



Lesson 3A.7:

- 13) Solve the logarithmic equations for  $x$ . Be sure to check your solutions for logarithms of negative numbers.

- $\log_4(x + 9) + \log_4(x - 3) = 3$
- $\log_3(x + 8) - \log_3(x - 2) = 4$

Lesson 3A.8:

- In 2000, the population of Aurora, IL was 144,174 people. In 2020 it was 180,355. Estimate in what year the population of Aurora will be 215,000.
- The half-life of Iodine-131 is 8 days. How many days will it take for 95% of a sample of Iodine-131 to decay?