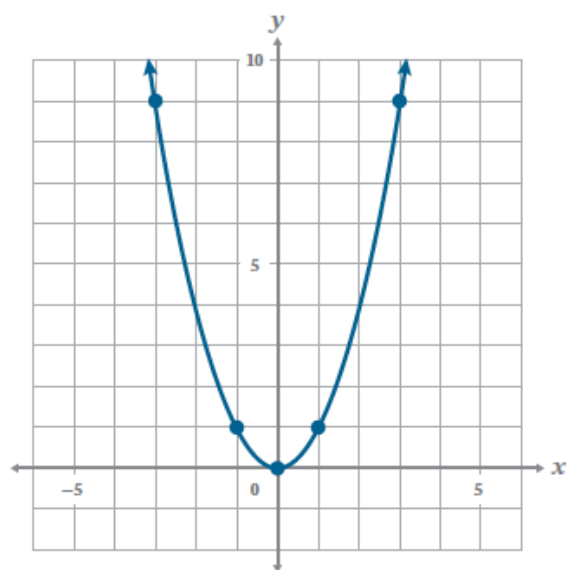


<b>Problem</b>	1	2	3	4	5	6	7	8	9	10	11	12
<b>Lesson Origin</b>	26, 30	26	28	27	28	29	26	27	29	30	28	27

<b>Problem</b>	13	14	15	16	17	18	19	20	21	22	23	24	25
<b>Lesson Origin</b>	29	29	30	30	30	26	29	27	26	30	26	29	29

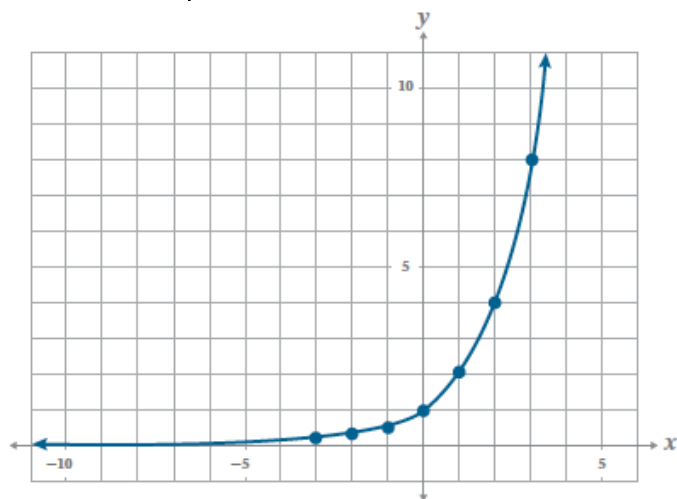
1.  
A.

$x$	$p(x)$
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9



B.

$x$	$r(x)$
-3	$\frac{1}{8}$
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8



C.

	$p(x)$	$r(x)$
<b>domain</b>	all real numbers, or $\mathcal{R}$ , or $(-\infty, \infty)$	all real numbers, or $\mathcal{R}$ , or $(-\infty, \infty)$
<b>range</b>	$y \geq 0$ , or $[0, \infty)$	$y > 0$ , or $(0, \infty)$

D.

Sample:

Similarities:

Both  $p(x)$  and  $r(x)$  have the same domain. The graphs of both are only in the first and second quadrant. Because  $p(2) = r(2) = 4$ , both graphs share the point  $(2, 4)$ .

The functions are both positive functions, and the range values only contain positive numbers.

Differences:

The function  $p(x)$  is a u-shaped graph, or a parabola. Reading the graph from left to right, the graph decreases, then switches directions and increases. The values in the table are integers only (but rational numbers do exist as part of the function). The  $y$ -intercept is the origin, or  $(0, 0)$ , making the range greater than or equal to zero. The solution to  $p(x)$  is  $x = 0$  because this is the  $x$ -intercept of the graph.

The function  $r(x)$  represents an exponential growth function. Reading the graph from left to right, the values grow exponentially larger. The table includes values smaller than 1. The range is greater than zero since the graph will never actually reach zero. The  $y$ -intercept is  $(0, 1)$  since any base raised to the zero power is equal to one. The common ratio for  $r(x)$  is 2.

2. D

 $a$  is negative, maximum

$$\text{Vertex: } x = -\left(\frac{b}{2a}\right)$$

$$x = -\left(\frac{6}{2(-3)}\right) = 1$$

$$\begin{aligned} f(1) &= -3(1)^2 + 6(1) + 4 \\ &= -3 + 6 + 4 = 7 \end{aligned}$$

Maximum,  $(1, 7)$ 

Distractor Rationale:

A) This is incorrect because when  $a = -3$ , the parabola has a maximum point.B) This is incorrect because when  $a = -3$ , the parabola has a maximum point. This also represents the function when  $a = 3$ .C) This represents the function when  $a = 3$ .

3. D

$$x^{-2} x^{-3} y^4 y^{-1} z^1 z^{-3}$$

$$x^{-5} y^3 z^{-2}$$

Distractor Rationale:

A) This adds  $-2$  and  $3$  for the base  $x$ , when the values should be subtracted.B) This adds  $-2$  and  $3$  for the base  $x$ , when the values should be subtracted.C) This subtracts  $4$  from  $1$  instead of  $1$  from  $4$  for the base  $y$ .

4. B

Dashed Parabola, shade inside

$$\text{Vertex: } x = -\left(\frac{b}{2a}\right) = -\left(\frac{-5}{2(3)}\right) = \frac{5}{6}$$

$$y = 3\left(\frac{5}{6}\right)^2 - 5\left(\frac{5}{6}\right) = 3\left(\frac{25}{36}\right) - \frac{25}{6}$$

$$y = \frac{75}{36} - \frac{150}{36} = \frac{-75}{36} = -2.083$$

(0.83, -2.083)

Distractor Rationale:

A has a solid parabola rather than a dashed parabola.

C represents the less than or equal to symbol.

D represents when  $b = 5$  rather than  $-5$ .

5. A

$$(3x^5y^7)^0 (2^8x^2y^{-10})^{\frac{1}{4}}$$

$$1\left(2^{\frac{8}{4}}x^{\frac{2}{4}}y^{\frac{-10}{4}}\right)$$

$$2^2x^{\frac{1}{2}}y^{\frac{-5}{2}}$$

$$4x^{\frac{1}{2}}y^{\frac{-5}{2}}$$

Distractor Rationale:

B) This ignores that the first expression is all to the power of zero and instead multiplies 3 by 4, which results in an incorrect coefficient. It also has the incorrect sign of the exponent for the base  $y$ .C) This has a negative exponent for the base  $x$  and also an incorrect sign of the exponent for the base  $y$ .

D) This ignores that the first expression is all to the power of zero and instead multiplies 3 by 4, which results in an incorrect coefficient.

6. C

$$\sqrt{72x^5y^8}$$

$$\sqrt{2^3 \cdot 3^2x^5y^8}$$

$$6x^2y^4\sqrt{2x}$$

Distractor Rationale:

A) This divides 72 by 2 rather than taking the square root.

B) This divides 72 by 2 rather than taking the square root, and it does not have the  $x$  as part of the radicand. There will be a remainder since 5 is an odd exponent.D) This does not have  $x$  as part of the radicand. There will be a remainder since 5 is an odd exponent.

7. B

$$g(x) = 2x^2 + 5x + 2$$

$$0 = 2x^2 + 5x + 2$$

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

$$2x + 1 = 0, x + 2 = 0$$

$$x = -\frac{1}{2}, -2 \text{ or } x = -0.5, -2$$

Distractor rationale:

- A) This represents the values for the  $y$ -intercept rather than the  $x$ -intercept.
- C) This represents the  $y$ -intercept.
- D) This represents the roots ignoring the negative signs.

8. B

There is no work for this problem.

Distractor Rationale:

- A) This adds 3 rather than subtracting 3 from the value of  $h$ .
- C) This changes  $h$  to 3 rather than subtracting 3.
- D) This switches the sign of the  $h$ -value.

9. C

$$r^2 - 2 = 18$$

$$r^2 = 20$$

$$r = \pm \sqrt{20}$$

$$r = \pm 2\sqrt{5}$$

Distractor Rationale:

- A) This subtracts 2 from 18 rather than adding 2.
- B) This forgets to take the square root of 4 after finding the factors of 20.
- D) This divides the square root of 20 by 2 rather than taking the square root.

10. D

There is no work for this problem.

Distractor Rationale:

- A) This represents a linear equation, not an exponential equation.
- B) This has a negative sign but the graph represents exponential growth.
- C) This has a negative sign but the graph represents exponential growth.

11. A

$$\frac{(a^5 b^{-2} c^0)^3}{(a^0 b^{-4} c^4)}$$

$$\frac{(a^{15} b^{-6} c^0)}{(a^0 b^{-4} c^4)}$$

$$a^{15} b^{-6} b^4 c^{-4}$$

$$\frac{a^{15}}{b^2 c^4}$$

Distractor Rationale:

B) This places the base,  $b$  in the numerator and also combines the exponent for  $c$  incorrectly.C) This adds the exponent for the base  $b$  rather than subtracting.D) This adds the exponent for the base  $b$  rather than subtracting.

12. C

There is no work for this problem.

Distractor Rationale:

A) This has the value of  $h$  equal to a positive number.B) This has the value of  $h$  equal to a positive number and has the value of  $k$  equal to a negative number.D) This has the the value of  $k$  equal to a negative number.

13. D

$$\sqrt{27} + 2\sqrt{3} + \sqrt{81}$$

$$3\sqrt{3} + 2\sqrt{3} + 9$$

$$5\sqrt{3} + 9$$

Distractor Rationale:

A) This does not consider that numbers can be written in multiple forms.

B) This multiplies the coefficients of the radicals rather than adding them.

C) This takes the square root of 81 twice (the 4th root).

14. B

$$\sqrt{2v + 1} = 5$$

$$2v + 1 = 25$$

$$2v = 24$$

$$v = 12$$

Distractor Rationale:

A) This adds 1 rather than subtracting 1 from both sides.

C) This does not square 5 after squaring the expression on the side with the radical.

D) This does not square 5 after squaring the expression on the side with the radical and adds 1 rather than subtracting one.

15. C

There is no work for this problem.

Distractor Rationale:

A) This represents exponential decay.

B) This does not convert the percent to a decimal before substituting into the equation.

D) This represents exponential decay.

16. B

There is no work for this problem.

Distractor rationale:

A) This has restrictions on the domain when it should be all real numbers.

C) This has a range that would be correct if the coefficient was equal to a negative value.

D) This has restrictions on the domain when it should be all real numbers. It also has a range that would be correct if the coefficient was equal to a negative value.

17. A

$$5,253 = a(1 - 0.012)^5$$

$$5,253 = a(0.988)^5$$

$$\frac{5,253}{(0.988)^5} = a$$

$$a = 5,580$$

Distractor Rationale:

B) This uses 5,253 as the value of  $a$  rather than the value of  $y$  and adds 1.2% when the population declines.C) This uses 5,253 as the value of  $a$  rather than the value of  $y$  and subtracts 1.2%.

D) This uses a rate of 12% rather than 1.2%.

18. C

$$\text{Vertex: } x = -\left(\frac{b}{2a}\right) = -\left(\frac{-4}{2(-1)}\right) = -2$$

$$f(-2) = -(-2)^2 - 4(-2) + 5 = -4 + 8 + 5 = 9$$

Vertex: (-2, 9) down

 $y$ -intercept: (0, 5)

$$x\text{-intercepts: } -x^2 - 4x + 5 = 0$$

$$-(x^2 + 4x - 5) = 0$$

$$x^2 + 4x - 5 = 0$$

$$(x + 5)(x - 1) = 0$$

$$x = -5, 1$$

Distractor rationale:

A) This ignores the negative sign in front of  $x^2$ .B) This ignores the negative sign in front of  $x$ .D) This makes  $c = -5$  rather than 5.

19. D

$$81^{2a} = 27^{\frac{1}{3}}$$

$$(3^4)^{2a} = (3^3)^{\frac{1}{3}}$$

$$3^{8a} = 3^1$$

$$8a = 1$$

$$a = \frac{1}{8}$$

Distractor rationale:

A) This tries to use 9 as the base rather than 3.

B) This drops the exponent  $\left(\frac{1}{3}\right)$  from the equation.C) This drops the coefficient 2 next to  $a$ .

20. A

There is no work for this problem.

Distractor Rationale:

B) This makes  $a = -8$  wider; however, when  $a > 1$  the graph is more narrow.C) This does not include the reflection over the  $x$ -axis.D) This makes  $a = -8$  wider; however, when  $a > 1$  the graph is more narrow.

21. D

$$\text{Vertex: } x = -\left(\frac{b}{2a}\right) = -\left(\frac{-2}{2(4)}\right) = \frac{1}{4}$$

$$\begin{aligned} f\left(\frac{1}{4}\right) &= 4\left(\frac{1}{4}\right)^2 - 2\left(\frac{1}{4}\right) + 5 \\ &= 4\left(\frac{1}{16}\right) - \frac{1}{2} + 5 \\ &= \frac{1}{4} - \frac{1}{2} + 5 \\ &= 4.75 \end{aligned}$$

Minimum at (0.25, 4.75)

Distractor Rationale:

- A) This is the correct domain, but the problem is asking for the range.  
 B) This represents a function with a maximum vertex rather than a minimum.  
 C) This uses the  $x$ -coordinate rather than the  $y$ -coordinate for the range.

22. C

There is no work for this problem.

Distractor Rationale:

- A) This uses the value of  $t$  instead of the common ratio.  
 B) This uses the rate of 15% rather than the common ratio.  
 D) This names the function as a growth function even though the common ratio is less than 1.

23. B

There is no work for this problem.

Distractor Rationale:

- A) uses  $(a, h)$  rather than  $(h, k)$   
 C) This has incorrect signs for  $h$  and  $k$ .  
 D) This is  $(-h, -k)$ .

24.

$8nb^2\sqrt[3]{b^2}$  This divides 24 by 3 rather than taking the cubed root.

$2nb^2\sqrt[3]{3b^2}$

$2^{\frac{3}{2}}3^{\frac{1}{2}}n^{\frac{3}{2}}b^{\frac{8}{2}}$  This uses the index 2 rather than 3.

$2^{\frac{3}{3}}3^{\frac{1}{3}}n^{\frac{3}{3}}b^{\frac{8}{3}}$

$$\sqrt[3]{24n^3b^8}$$

$$\sqrt[3]{2^33^1n^3b^8}$$

$$2nb^2\sqrt[3]{3b^2}$$

$$2^{\frac{3}{3}}3^{\frac{1}{3}}n^{\frac{3}{3}}b^{\frac{8}{3}}$$

25.

 2 This is the answer for  $y^2$  instead of  $y$ .  $-\sqrt{2}$   $\sqrt{2}$  no solution This equation does have a solution.

$$y^2 + 3 = 5$$

$$y^2 = 2$$

$$y = \pm\sqrt{2}$$