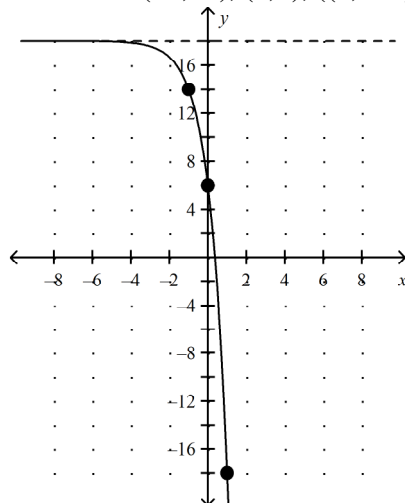# MCR3U - WS - Transformations & Graphing of Exponential Functions

Determine the exponential equation given:
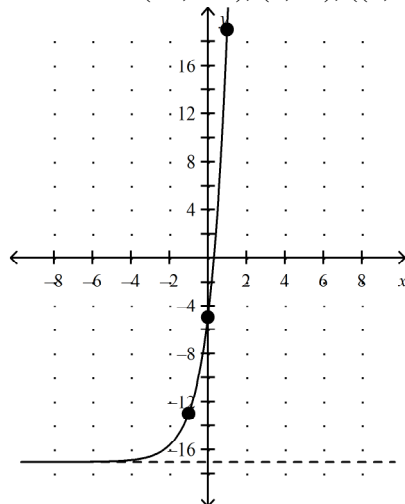
1. (a) common ratio 5.
    (b) horizontal asymptote at $y = -9$.
    (c) y-intercept of –5.

2. (a) common ratio $\frac{1}{4}$.
    (b) horizontal asymptote at $y = -13$.
    (c) y-intercept of –5.

3. (a) common ratio 2.
    (b) horizontal asymptote at $y = 18$.
    (c) y-intercept of 21.

4. (a) common ratio 3.
    (b) horizontal asymptote at $y = -25$.
    (c) y-intercept of –35.

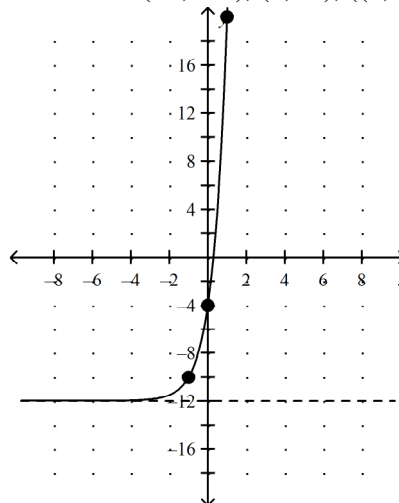Determine the exponential equation for each of the following graphs:

5. Points are: $(-1, 14), (0,6), ((1,-18)$

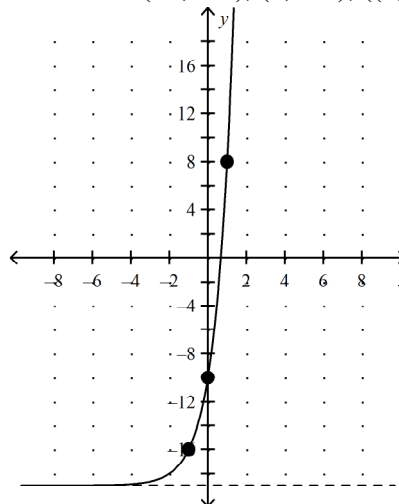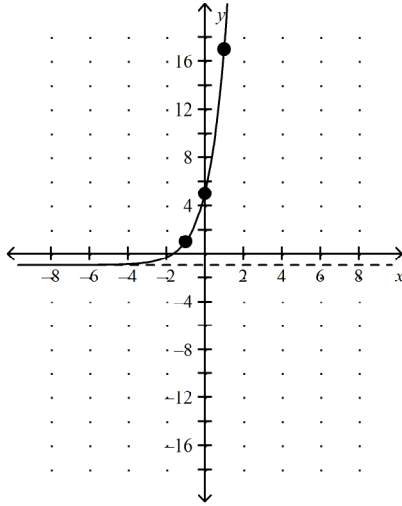6. Points are: $(-1,-13), (0,-5), ((1,19)$

7. Points are: $(-1,-10), (0,-4), ((1,20)$
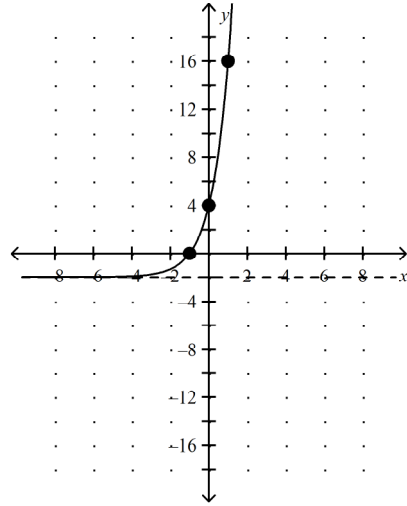

8. Points are: $(-1,-16), (0,-10), ((1,8)$

9. Points are: $(-1,1)$, $(0,5)$, $((1,17)$

10. Points are: $(-1,0)$, $(0,4)$, $((1,16)$

Rewrite the following using only vertical transformations (i.e., in the form $y = a(b)^x + q$).

11. $y = 3(2)^{4(x-1)} - 3$

12. $y = 4(125)^{\frac{-1}{3}x} + 4$

13. $y = (3125)^{\frac{-1}{5}(x+2)} + 1$

14. $y = 3(2)^{-(x+5)} - 1$

15. $y = 2(256)^{\frac{1}{4}(x+3)} - 1$

16. $y = \frac{1}{5}(64)^{\frac{-1}{3}x} + 3$

17. $y = 4(81)^{\frac{-1}{4}(x-3)} - 1$

18. $y = \frac{1}{2}(16)^{\frac{1}{2}(x+1)}$

19. $y = \frac{1}{5}(81)^{\frac{-1}{4}(x-3)} + 2$

20. $y = 5(8)^{\frac{-1}{3}(x-3)} + 5$

21. $y = 5(625)^{\frac{1}{4}x} + 3$

22. $y = 2(25)^{\frac{-1}{2}(x+3)} + 4$

23. $y = 3(2)^{3(x-1)} + 2$

24. $y = 2(125)^{\frac{1}{3}(x+5)} + 4$

Determine the equation of the exponential function corresponding to the following points.

25. $(1, 4)$, $(2, -32)$, $(3, -176)$, $(4, -752)$

26. $(1, -15)$, $(2, -21)$, $(3, -39)$, $(4, -93)$

27. $(-1, -\frac{23}{3})$, $(-2, -\frac{47}{3})$, $(-3, -\frac{95}{3})$, $(-4, -\frac{191}{3})$

28. $(1, \frac{29}{6})$, $(2, \frac{89}{6})$, $(3, \frac{209}{6})$, $(4, \frac{449}{6})$

29. $(-1, -\frac{13}{3})$, $(-2, \frac{95}{3})$, $(-3, \frac{527}{3})$, $(-4, \frac{2255}{3})$

30. $(1, \frac{5}{6})$, $(2, \frac{149}{6})$, $(3, \frac{581}{6})$, $(4, \frac{1877}{6})$

31. $(1, \frac{49}{6})$, $(2, \frac{85}{6})$, $(3, \frac{157}{6})$, $(4, \frac{301}{6})$

MCR3U - WS - Transformations & Graphing of Exponential Functions
Answer Section

1. ANS:
   $$y = 4\left(5^x\right) - 9$$

   PTS: 1
2. ANS:
   $$y = 8\left(\frac{1}{4}\right)^x - 13$$

   PTS: 1
3. ANS:
   $$y = 3\left(2^x\right) + 18$$

   PTS: 1
4. ANS:
   $$y = -10\left(3^x\right) - 25$$

   PTS: 1
5. ANS:
   $$y = -12\left(3^x\right) + 18$$
   $$y = -12\left(\frac{1}{3}\right)^{-x} + 18$$

   PTS: 1
6. ANS:
   $$y = 12\left(3^x\right) - 17$$
   $$y = 12\left(\frac{1}{3}\right)^{-x} - 17$$

   PTS: 1
7. ANS:
   $$y = 8\left(4^x\right) - 12$$
   $$y = 8\left(\frac{1}{4}\right)^{-x} - 12$$

   PTS: 1

8. ANS:

$$y = 9\left(3^x\right) - 19$$

$$y = 9\left(\frac{1}{3}\right)^{-x} - 19$$

PTS: 1

9. ANS:

$$y = 6\left(3^x\right) - 1$$

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

PTS: 1

10. ANS:

$$y = 6\left(3^x\right) - 2$$

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

PTS: 1

11. ANS:
$y = 0.1875 \, (16)^x - 3$

PTS: 1

12. ANS:

$y = 4 \, (\frac{1}{5})^x + 4$

PTS: 1

13. ANS:

$y = 0.04 \, (\frac{1}{5})^x + 1$

PTS: 1

14. ANS:

$y = 0.09375 \, (\frac{1}{2})^x - 1$

PTS: 1

15. ANS:
$y = 128 \, (4)^x - 1$

PTS: 1

16. ANS:

$$y = 0.2 \left(\frac{1}{4}\right)^x + 3$$

PTS: 1

17. ANS:

$$y = 108 \left(\frac{1}{3}\right)^x - 1$$

PTS: 1

18. ANS:
$$y = 2 (4)^x$$

PTS: 1

19. ANS:

$$y = 5.4 \left(\frac{1}{3}\right)^x + 2$$

PTS: 1

20. ANS:

$$y = 40 \left(\frac{1}{2}\right)^x + 5$$

PTS: 1

21. ANS:
$$y = 5 (5)^x + 3$$

PTS: 1

22. ANS:

$$y = 0.016 \left(\frac{1}{5}\right)^x + 4$$

PTS: 1

23. ANS:
$$y = 0.375 (8)^x + 2$$

PTS: 1

24. ANS:
$$y = 6250 (5)^x + 4$$

PTS: 1

25. ANS:
$$y = -3\left(4^x\right) + 16$$
$$y = -3\left(\frac{1}{4}\right)^{-x} + 16$$

PTS: 1
26. ANS:
$$y = -\left(3^x\right) - 12$$
$$y = -\left(\frac{1}{3}\right)^{-x} - 12$$

PTS: 1
27. ANS:
$$y = -4\left(2^{-x}\right) + 1/3$$
$$y = -4\left(\frac{1}{2}\right)^{x} + 1/3$$

PTS: 1
28. ANS:
$$y = 5\left(2^x\right) - 31/6$$
$$y = 5\left(\frac{1}{2}\right)^{-x} - 31/6$$

PTS: 1
29. ANS:
$$y = 3\left(4^{-x}\right) - 49/3$$
$$y = 3\left(\frac{1}{4}\right)^{x} - 49/3$$

PTS: 1
30. ANS:
$$y = 4\left(3^x\right) - 67/6$$
$$y = 4\left(\frac{1}{3}\right)^{-x} - 67/6$$

PTS: 1

31. ANS:

$$y = 3\left(2^x\right) + 13/6$$

$$y = 3\left(\frac{1}{2}\right)^{-x} + 13/6$$

PTS: 1