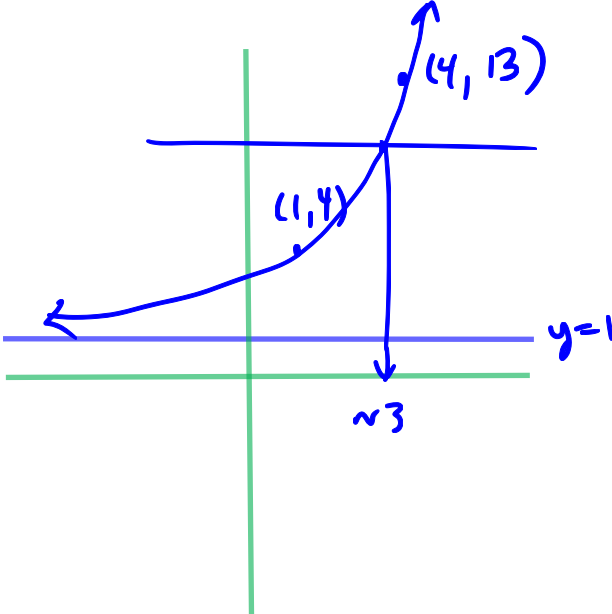
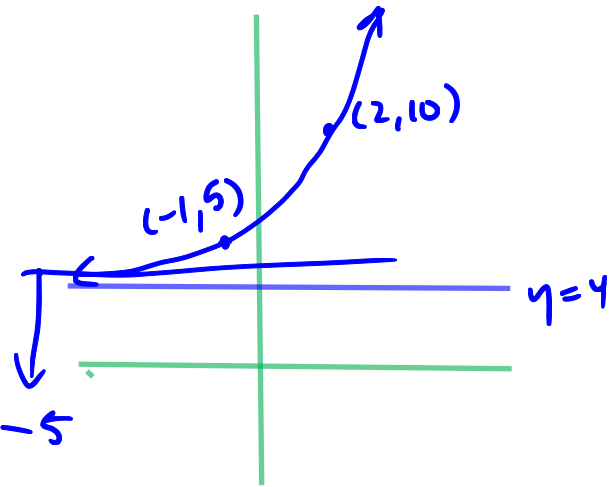


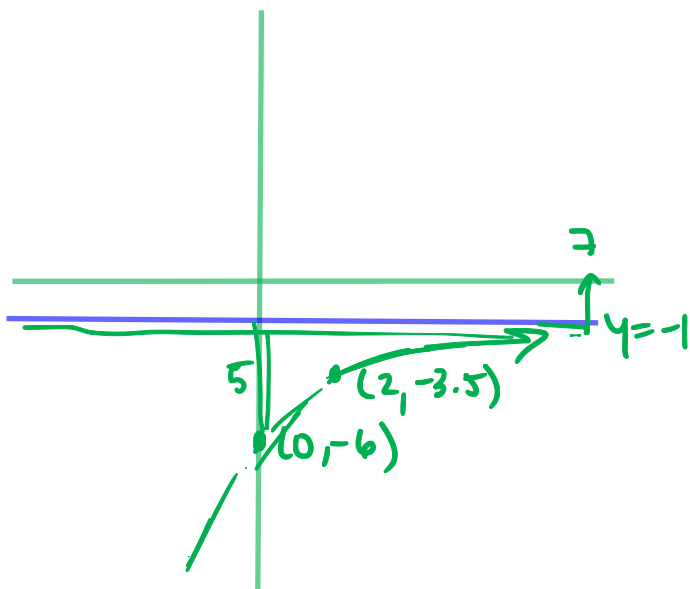
# Exponential Functions: Graphing Practice

**Goal:** Identify the characteristics of the graph from the equation and sketch the exponential function labelling the asymptote, critical point and one other point on the graph. Find the exact equation in base  $e$ .

1.	<p style="text-align: center;"><math>y = 3 \cdot 4^{\frac{x-1}{3}} + 1</math>    solve when <math>y = 10</math></p>  <p style="text-align: right;"> <math>10 = 3 \cdot 4^{\frac{x-1}{3}} + 1</math>  <math>3 = e^{\ln 4 \cdot \frac{(x-1)}{3}}</math>  <math>\frac{3 \ln 3}{\ln 4} + 1 = x</math>  <math>= 3.38</math> </p>
2.	<p style="text-align: center;"><math>y = 6^{\frac{x+1}{3}} + 4</math>    solve when <math>y = 4.1</math></p>  <p style="text-align: right;"> <math>4.1 = 6^{\frac{x+1}{3}} + 4</math>  <math>0.1 = e^{\frac{\ln 6 \cdot (x+1)}{3}}</math>  <math>\frac{3 \ln 0.1}{\ln 6} - 1 = x</math>  <math>x = -4.86</math> </p>

3.

$$y = -5 \left(\frac{1}{2}\right)^{\frac{x}{2}} - 1 \quad \text{solve when } y = -1.01$$



$$-1.01 = -5 \left(\frac{1}{2}\right)^{\frac{x}{2}} - 1$$

$$\frac{0.01}{5} = e^{\ln(1/2) \cdot \frac{x}{2}}$$

$$\frac{2 \ln\left(\frac{0.01}{5}\right)}{\ln(0.5)} = x$$

$$x = 17.93$$

4.

$$y = -2 \frac{x+5}{3} + 1 \quad \text{solve when } y = -15$$

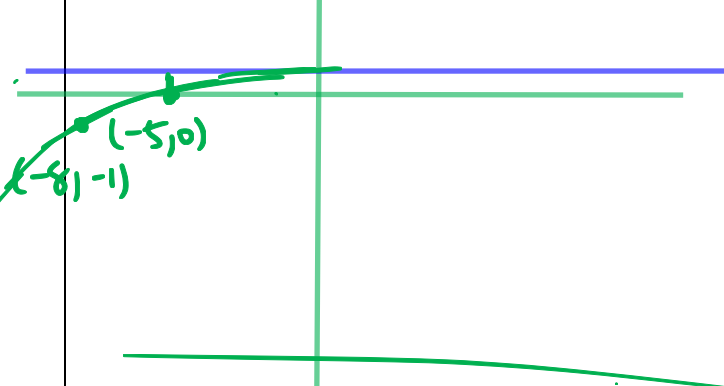
$$\frac{x+5}{3}$$

$$-15 = -2 \frac{x+5}{3} + 1$$

$$16 = \frac{-\ln 2 (x+5)}{3}$$

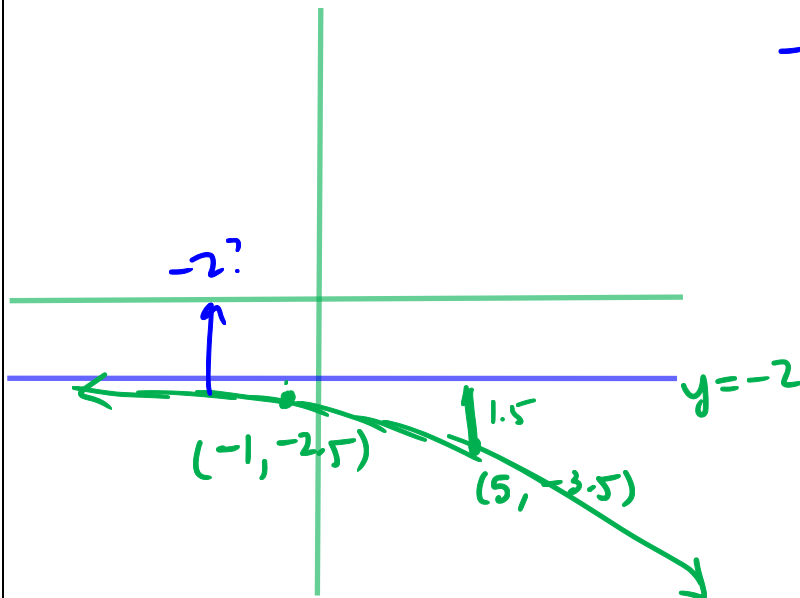
$$\frac{3 \ln 16}{-\ln 2} - 5 = x$$

$$x = -17$$



5.

$$y = -\frac{3}{2} \cdot 3^{\frac{x-5}{6}} - 2 \quad \text{solve when } y = -2.3$$



$$-2.3 = -1.5 \cdot e^{\frac{\ln 3}{6}(x-5)} - 2$$

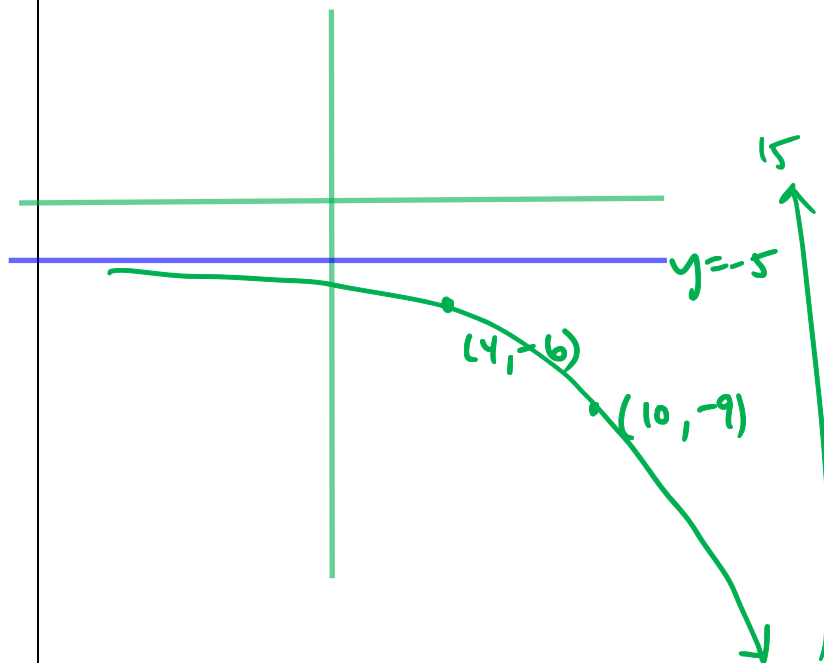
$$\frac{0.3}{1.5} = e^{\frac{\ln 3}{6}(x-5)}$$

$$\frac{6 \ln\left(\frac{0.3}{1.5}\right)}{\ln 3} + 5 = x$$

$$x = -3.79$$

6.

$$y = -4 \cdot 4^{\frac{x-4}{6}} - 5 \quad \text{solve when } y = -30$$



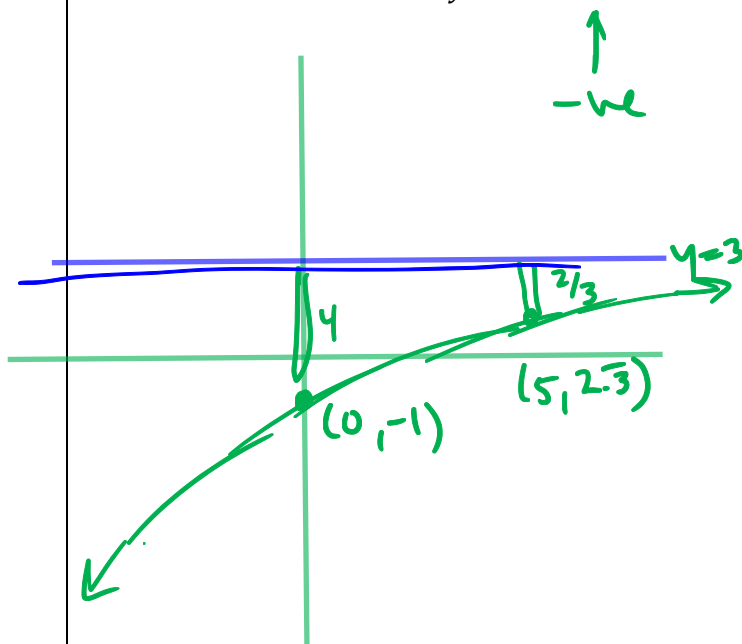
$$-30 = -e^{\frac{\ln 4}{6}(x-4)} - 5$$

$$\frac{6 \ln 25}{\ln 4} + 4 = x$$

$$x = 17.93$$

7.

$$y = -4 \cdot 6^{\frac{x}{5}} + 3 \quad \text{solve when } y = 2.9$$



$$2.9 = -4 e^{\frac{\ln 6}{5} x} + 3$$

$$\frac{0.1}{4} = e^{-\frac{\ln 6}{5} x}$$

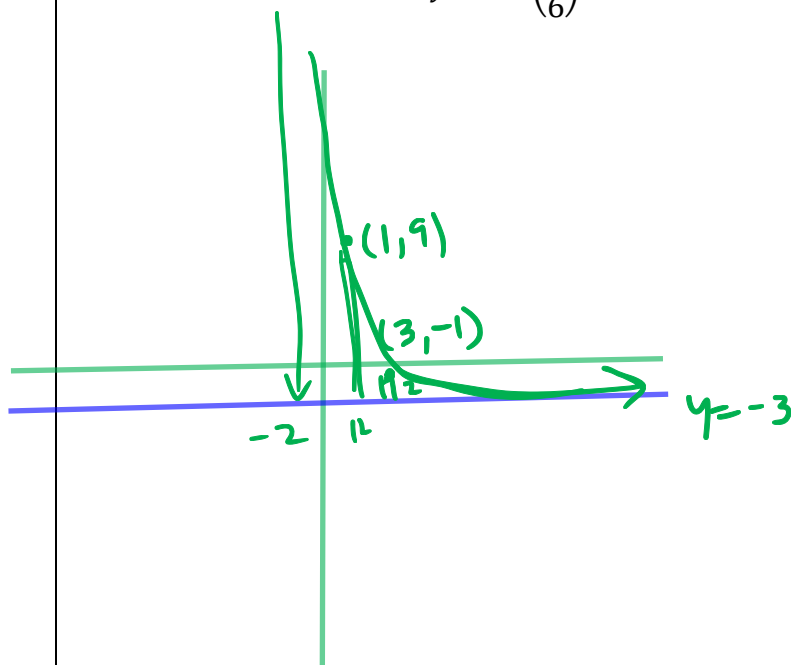
↓  
15?

$$\Rightarrow \frac{-5 \ln(0.1/4)}{\ln 6} = x$$

$$x = 10.29$$

8.

$$y = 2 \cdot \left(\frac{1}{6}\right)^{\frac{x-3}{2}} - 3 \quad \text{solve when } y = 40$$



$$40 = 2 \left(\frac{1}{6}\right)^{\frac{x-3}{2}} - 3$$

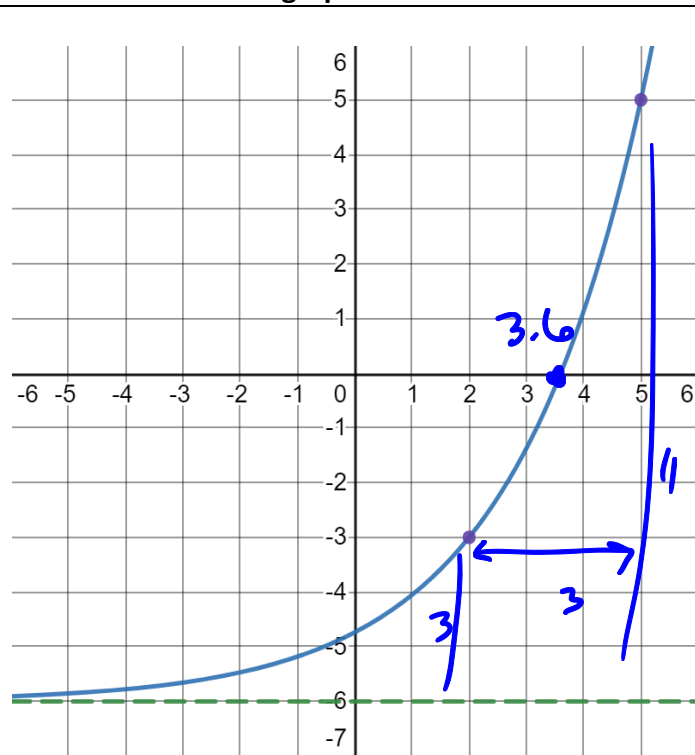
$$\frac{43}{2} = e^{\frac{\ln(1/6)}{2} (x-3)}$$

$$\frac{2 \ln(43/2)}{\ln(1/6)} + 3 = x$$

$$x = -0.42$$

Identify the characteristics of the following graphs and build an equation in base  $e$  that describes them.

Find the zero of each graph

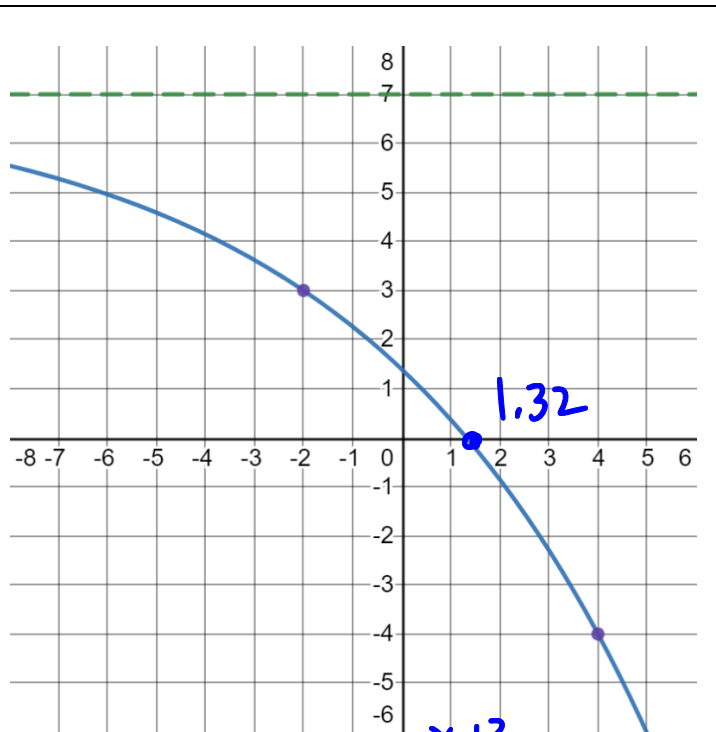


$$y = 3 \left( \frac{11}{3} \right)^{\frac{x-2}{3}} - 6$$

$$= 3 e^{\frac{1}{3} \ln(11/3)(x-2)} - 6$$

zero @

$$\frac{3 \ln 2}{\ln(11/3)} + 2 = 3.6$$

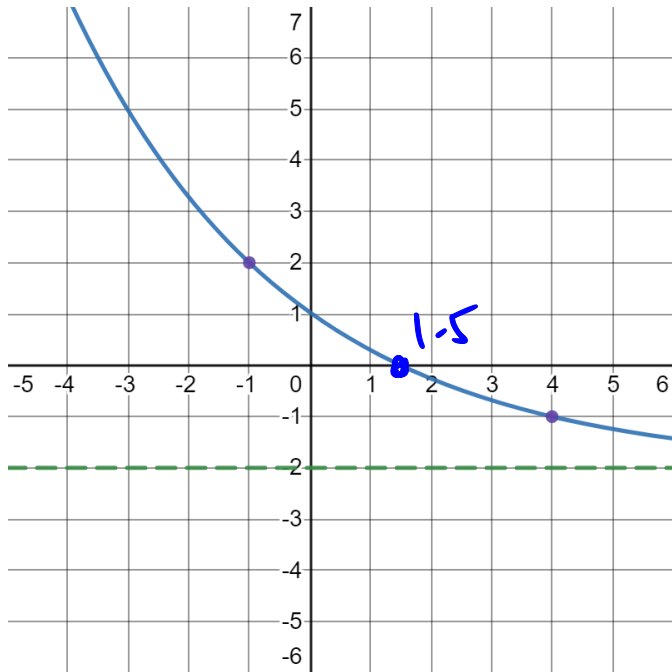


$$y = -4 \left( \frac{11}{4} \right)^{\frac{x+2}{6}} + 7$$

$$= -4 e^{\frac{1}{6} \ln(11/4)(x+2)} + 7$$

zero @

$$\frac{6 \ln(7/4)}{\ln(11/4)} - 2 = 1.32$$

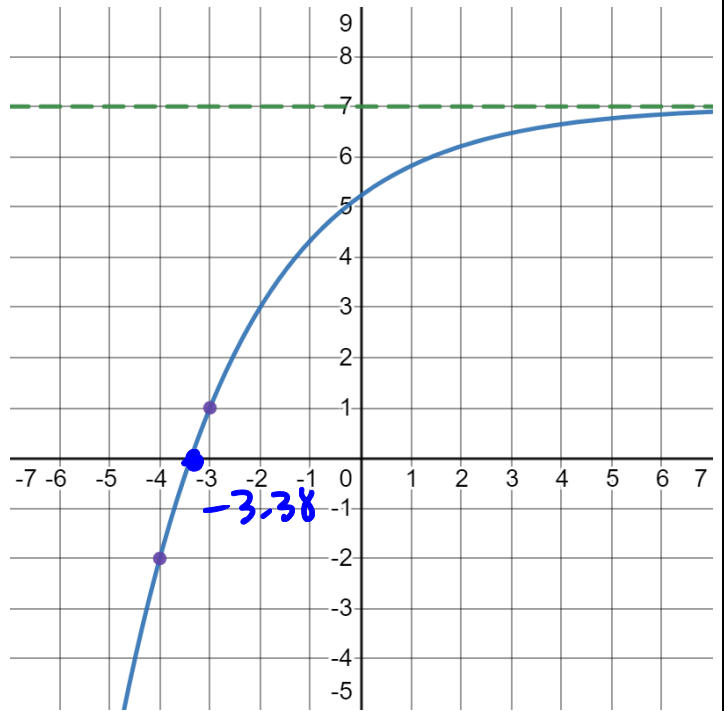


$$y = (4)^{\frac{x-4}{-5}} - 2$$

$$= e^{-\frac{1}{5} \ln 4 (x-4)} - 2$$

zero @

$$\frac{-5 \ln 2}{\ln 4} + 4 = 1.5$$



$$y = -9 \left( \frac{2}{3} \right)^{x+4} + 7$$

$$= -9 e^{\ln(2/3)(x+4)} + 7$$

zero @

$$\frac{\ln\left(\frac{7}{9}\right)}{\ln(2/3)} - 4 = -3.38$$