

6.3 Practice Problems

1. Graph the following exponential functions. State the domain and range of each function

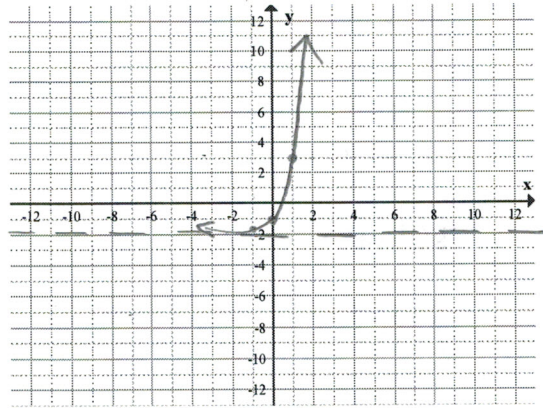
a) $f(x) = 5^x - 2$

$$y = 5^x$$

x	y
-1	1/5
0	1
1	5

↑
Vertical
Shift down
2 units

Domain $(-\infty, \infty)$
Range $(0, \infty)$



HA
 $y = -2$

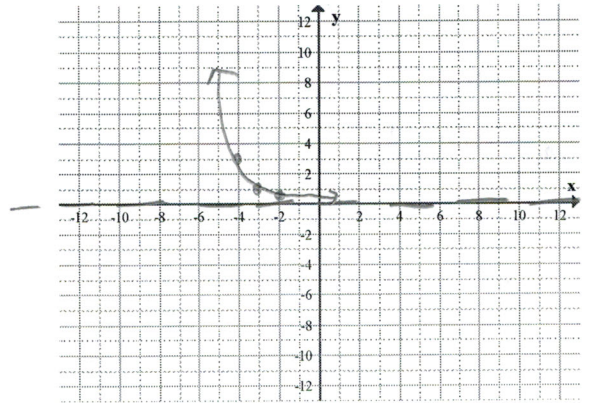
b) $g(x) = \left(\frac{1}{3}\right)^{x+3}$

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

x	y
-1	3
0	1
1	1/3

↑
horizontal
Shift left +3

Domain $(-\infty, \infty)$
Range $(0, \infty)$

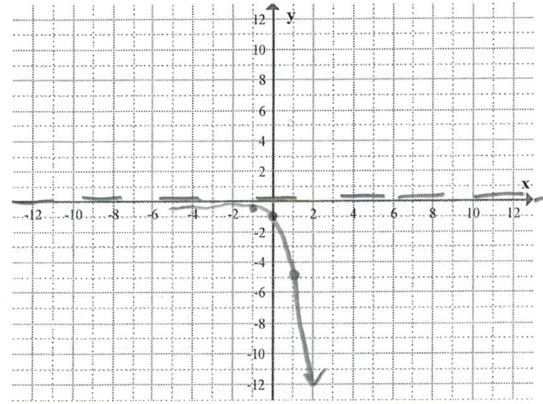


HA
 $y = 0$

c) $h(x) = -5^x$

↑
reflection
over x-axis

Domain $(-\infty, \infty)$
Range $(-\infty, 0)$



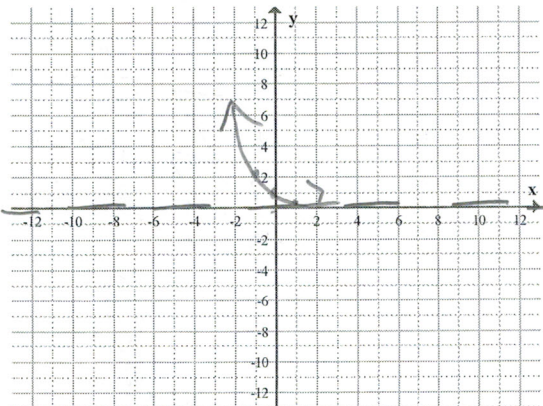
HA
 $y = 0$

d) $f(x) = e^{-x}$

↑
reflection
over y-axis

$$y = e^x$$

x	y
-1	1/e ≈ 0.3679
0	1
1	e ≈ 2.718



HA
 $y = 0$

2. $4^{2x+4} = 64$

$4^{2x+4} = 4^3$

$2x + 4 = 3$
 $-4 \quad -4$

$\frac{2x}{2} = \frac{-1}{2}$

$x = \frac{-1}{2}$

3. $8^{x+3} = 4^{x-2}$

$2^{3(x+3)} = 2^{2(x-2)}$

$3(x+3) = 2(x-2)$

$3x + 9 = 2x - 4$
 $-2x \quad -2x$

$x + 9 = -4$
 $-9 \quad -9$

$x = -13$

4. $3^{2x+1} = \frac{1}{27}$

$3^{2x+1} = 3^{-3}$

$2x + 1 = -3$
 $-1 \quad -1$

$\frac{2x}{2} = \frac{-4}{2}$

$x = -2$

5. $5^x = 25^x$

$5^{x^2} = 5^{2x}$

$x^2 = 2x$

$x^2 - 2x = 0$

$x(x-2) = 0$

$x = 0$ $x - 2 = 0$
 $\sqrt{x = 2}$

6. Determine whether the function given by the table is linear, exponential, or neither. If the function is linear, find a linear function that models the data; if it is exponential, find an exponential function that models the data.

x	y	ARC	Ratio
-2	$-\frac{4}{9}$	$\frac{-\frac{4}{3} - (-\frac{4}{9})}{-1 - (-2)} \approx -0.86$	$\frac{-\frac{4}{3}}{-\frac{1}{3}} = \frac{-4 \cdot -3}{1 \cdot 4} = 3$
-1	$-\frac{4}{3}$	$\frac{-4 - (-\frac{4}{3})}{0 - (-1)} \approx -2.7$	$\frac{-\frac{4}{3}}{\frac{1}{3}} = \frac{-4 \cdot 3}{1 \cdot 4} = 3$
0	-4	$\frac{-12 - (-4)}{1 - 0} = -8$	$\frac{-12}{-4} = 3$
1	-12	$\frac{-36 - (-12)}{2 - 1} = -24$	$\frac{-36}{-12} = 3$
2	-36		

x	y	ARC	Ratio
-2	10	$\frac{8 - 10}{-1 - (-2)} = \frac{-2}{1} = -2$	$\frac{8}{10} = \frac{4}{5}$
-1	8	$\frac{6 - 8}{0 - (-1)} = \frac{-2}{1} = -2$	$\frac{6}{8} = \frac{3}{4}$
0	6	$\frac{4 - 6}{1 - 0} = \frac{-2}{1} = -2$	$\frac{4}{6} = \frac{2}{3}$
1	4	$\frac{2 - 4}{2 - 1} = \frac{-2}{1} = -2$	$\frac{2}{4} = \frac{1}{2}$
2	2		

ARC Not the same
 \Rightarrow not linear

Ratio constant
 \Rightarrow exponential

$y = -4 \cdot 3^x$
 Initial value \uparrow
 ratio \uparrow

ARC constant
 \Rightarrow linear

Ratio not constant
 \Rightarrow not exponential

$y = -2x + 6$
 ARC \uparrow initial value \uparrow