

Math 111 WS 8, Exponential Functions Introduction

Name: Solutions

1. Given the following three functions represented in the tables, identify whether the function is linear, exponential, parabolic, or none of these.

a.

x	y = f(x)
-1	5
0	2
1	-1
2	-4
3	-7

linear

b.

x	y = g(x)
-1	32
0	16
1	8
2	4
3	2

exponential

c.

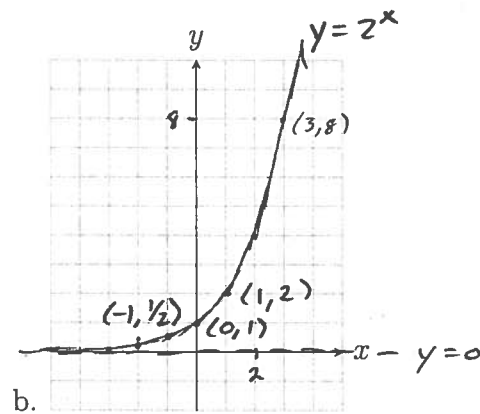
x	y = h(x)
-1	5
0	2
1	1
2	2
3	5

parabolic

2. Graph $\exp_2(x) = 2^x$ by first making a table of values.

a.

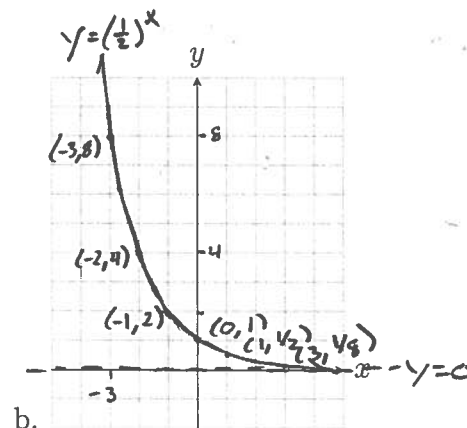
x	$\exp_2(x)$
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4



3. Graph $\exp_{1/2}(x) = \left(\frac{1}{2}\right)^x$ by first making a table of values.

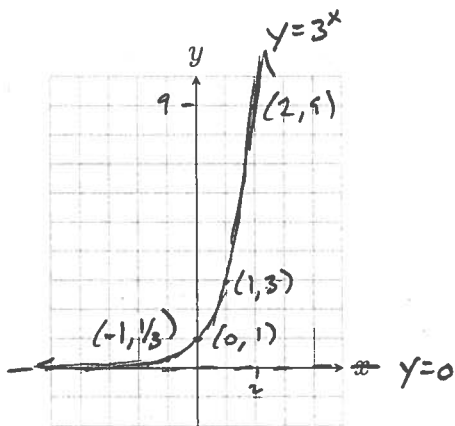
a.

x	$\exp_{1/2}(x)$
-3	8
-1	2
0	1
1	$\frac{1}{2}$
3	$\frac{1}{8}$

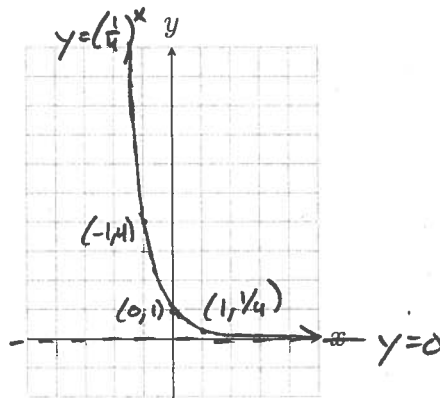


4. Graph the following functions in the coordinate planes provided.

a. $f(x) = 3^x$

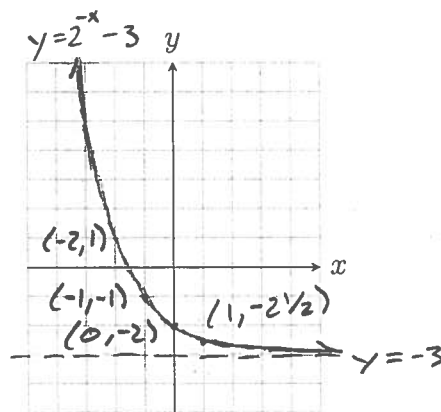


b. $g(x) = \left(\frac{1}{4}\right)^x$



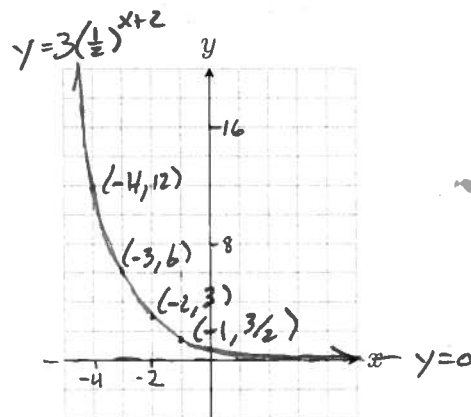
5. Graph $f(x) = 2^{-x} - 3$ using transformations and state the domain, range, and horizontal asymptote of f .

Key stuff of $y=2^x$	down 3	negate x 's
$(-1, 1/2)$	$(-1, -2 1/2)$	$(1, -2 1/2)$
$(0, 1)$	$(0, -2)$	$(0, -2)$
$(1, 2)$	$(1, -1)$	$(-1, -1)$
Asy: $y=0$	$y=-3$	$y=-3$
$(2, 4)$	$(2, 1)$	$(-2, 1)$



6. Graph $g(x) = 3\left(\frac{1}{2}\right)^{x+2}$ using transformations and state the domain, range, and horizontal asymptote of g .

Key stuff of $y=(1/2)^x$	mult y 's by 3	left 2
$(-2, 4)$	$(-2, 12)$	$(-4, 12)$
$(-1, 2)$	$(-1, 6)$	$(-3, 6)$
$(0, 1)$	$(0, 3)$	$(-2, 3)$
$(1, 1/2)$	$(1, 3/2)$	$(-1, 3/2)$
$y=0$	$y=0$	$y=0$



7. Solve the following exponential equations.

a. $3^{x+1} = 81$

$$3^{x+1} = 3^4$$

$$x+1=4$$

$$x=3$$

The sol set is $\{3\}$.

b. $4^{2x-1} = 8^{x+3}$

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

$$2^{4x-2} = 2^{3x+9}$$

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

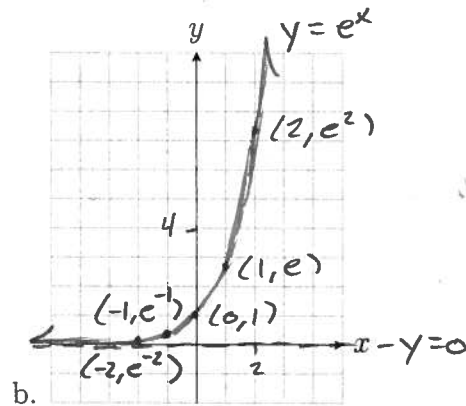
$$x=11$$

The sol set is $\{11\}$.

8. Graph $\exp_e(x) = e^x$ by first making a table of values.

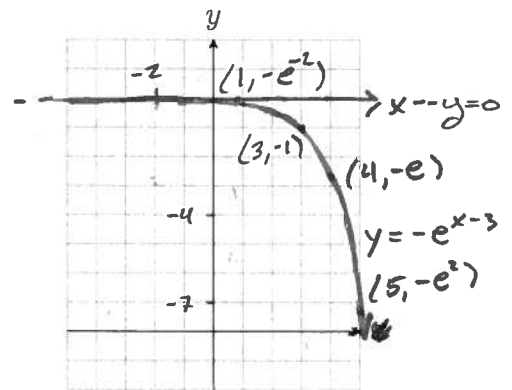
a.

x	$\exp_e(x)$
-2	$e^{-2} \approx 0.14$
-1	$e^{-1} \approx 0.37$
0	1
1	$e \approx 2.72$
2	$e^2 \approx 7.39$



9. Graph $g(x) = -e^{x-3}$ using transformations and state the domain, range, and horizontal asymptote of g .

Key stuff $y=e^x$	negate y_s	right 3
$(-2, 0.14)$	$(-2, -0.14)$	$(1, -0.14)$
$(0, 1)$	$(0, -1)$	$(3, -1)$
$(1, e)$	$(1, -e)$	$(4, -e)$
$(2, e^2 \approx 7.39)$	$(2, -7.39)$	$(5, -7.39)$
$y=0$	$y=0$	



10. Find an exponential function which passes through the two given points.

(a) (0, 50) and (3, 400)

$$f(x) = ab^x$$

$$f(0) = ab^0 = 50$$

$$\Rightarrow a = 50$$

$$f(x) = 50b^x$$

$$f(3) = 50b^3 = 400$$

$$\Rightarrow b^3 = 8$$

$$\Rightarrow b = 2$$

$$f(x) = 50 \cdot 2^x$$

(b) (0, 4) and (4, $\frac{1}{4}$)

$$f(0) = ab^0 = 4$$

$$\Rightarrow a = 4$$

$$f(x) = 4b^x$$

$$f(4) = 4b^4 = \frac{1}{4}$$

$$\Rightarrow b^4 = \frac{1}{16}$$

$$\Rightarrow b = \frac{1}{2}$$

$$f(x) = 4\left(\frac{1}{2}\right)^x$$

(c) $(-1, \frac{2}{3})$ and (2, 18)

$$f(-1) = ab^{-1} = \frac{2}{3}$$

$$f(2) = ab^2 = 18$$

$$\Rightarrow b^{-3} = \frac{1}{27}$$

$$b^3 = 27$$

$$b = 3$$

$$f(x) = a \cdot 3^x$$

$$f(2) = a \cdot 3^2 = 18$$

$$\Rightarrow a = 2$$

$$f(x) = 2 \cdot 3^x$$

(d) $(-2, \frac{125}{8})$ and (1, 8)

$$f(1) = ab^1 = 8$$

$$f(-2) = ab^{-2} = \frac{125}{8}$$

$$\Rightarrow b^3 = \frac{64}{125} \Rightarrow b = \frac{4}{5}$$

$$f(x) = a\left(\frac{4}{5}\right)^x$$

$$f(1) = a\left(\frac{4}{5}\right) = 8 \Rightarrow a = 10$$

$$f(x) = 10\left(\frac{4}{5}\right)^x$$

(e) $(-2, 125)$ and $(3, \frac{1}{25})$

$$f(3) = ab^3 = \frac{1}{25}$$

$$f(-2) = ab^{-2} = 125$$

$$\Rightarrow b^5 = \frac{1}{3125} \Rightarrow b = \frac{1}{5}$$

$$f(x) = a\left(\frac{1}{5}\right)^x$$

$$f(-2) = a\left(\frac{1}{5}\right)^{-2} = 125 \Rightarrow a = 5$$

$$f(x) = 5\left(\frac{1}{5}\right)^x$$

(f) $(-3, \frac{27}{16})$ and $(3, \frac{4}{27})$

$$f(3) = ab^3 = \frac{4}{27}$$

$$f(-3) = ab^{-3} = \frac{27}{16}$$

$$\Rightarrow b^6 = \frac{64}{729} \Rightarrow b = \frac{2}{3}$$

$$f(x) = a\left(\frac{2}{3}\right)^x$$

$$f(3) = a\left(\frac{2}{3}\right)^3 = \frac{4}{27} \Rightarrow a = \frac{1}{2}$$

$$f(x) = \frac{1}{2}\left(\frac{2}{3}\right)^x$$