19. A child's grandparents purchase a $10,000 bond fund that matures in 18 years to be used for her college education. The bond fund pays 4% interest compounded semiannually. How much will the bond fund be worth at maturity? What is the effective rate of interest? How long would it take the bond to double in value under these terms? $P = 10{,}000 \quad t = 18 \quad r = .04 \quad n = 2$

$A = 10{,}000\left(1 + \frac{.04}{2}\right)^{2 \cdot 18} = \$20{,}398.87$

When $t = 1$, $A = 10{,}000\left(1 + \frac{.04}{2}\right)^{2 \cdot 1} = \$10{,}404$

$A - P = I$ so $10{,}404 - 10{,}000 = \$404$ Interest for 1 year

$I = Prt \rightarrow 404 = 10{,}000(r)(1)$

$r = \frac{404}{10{,}000} = 0.0404$

$r = .0404$ effective interest 4.04%

$20{,}000 = 10{,}000\left(1 + \frac{.04}{2}\right)^{2t}$

$2 = \left(1 + \frac{.04}{2}\right)^{2t}$

$\ln 2 = 2t \ln\left(1 + \frac{.04}{2}\right)$

$t = \frac{\ln 2}{2\ln\left(1 + \frac{.04}{2}\right)}$

$t = 17.5$ yrs

Maturity: $20,398.87 Effective: 4.04% $t = 17.5$ yrs

20. The logistic growth model 4

$P(t) = \frac{0.8}{1 + 1.67e^{-0.16t}}$ represents the proportion of new cars with a Global Positioning System (GPS). Let $t = 0$ represent 2003, $t = 1$ represent 2004, etc. What proportion of new cars in 2003 had a GPS? What is the maximum proportion of new cars that will have a GPS?

In 2003 $t = 0$ $P(0) = \frac{.8}{1 + 1.67} = .2996$

30%

Proportion in 2003 is 30%.

Maximum proportion w/ GPS is 80%

21. A skillet is removed from an oven whose temperature is 450°F and placed in a room whose temperature is 70°F. After 5 minutes, the temperature of the skillet is 400°F. How long will it be until its temperature is 150°F? 4

$u_0 = 450°F \quad T = 70° \quad u(t) = T + (u_0 - T)e^{kt}$

$400 = 70 + (450 - 70)e^{5k}$

$330 = 380e^{5k}$

$\ln \frac{330}{380} = 5k$

$\frac{1}{5}\ln \frac{33}{38} = k \quad k \approx -.028$

$150 = 70 + (450 - 70)e^{-.028t}$

$80 = 380e^{-.028t}$

$\ln \frac{8}{38} = -.028t$

$\frac{\ln(8/38)}{-.028} = t$ $t \approx 55.6$ min to cool to 150°

22. The half-life of radioactive cobalt is 5.27 years. If 100 grams is present now, how much will be present in 20 years? 4

$50 = 100e^{k(5.27)}$

$\frac{1}{2} = e^{5.27k}$

$\ln \frac{1}{2} = 5.27k$

$\frac{\ln \frac{1}{2}}{5.27} = k \quad k \approx -.132$

$A(20) = 100e^{-.132 * 20}$

$A(20) = 7.136$

About 7.136g will be left in 20 years.

5ea.

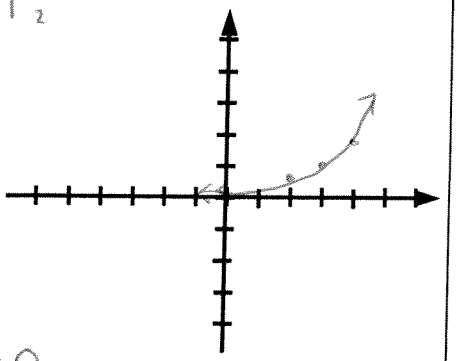
Use transformations to graph the functions below. (Show your tables or sketch a graph of each transformation.)

7. $f(x) = 2^{x-3}$

x	y
-1	$\frac{1}{2}$
0	1
1	2

right 3

x	y
2	$\frac{1}{2}$
3	1
4	2



Asymptote: $y = 0$

Domain: $(-\infty, \infty)$ Range: $y > 0$ $(0, \infty)$

8. $f(x) = -2^x + 3$

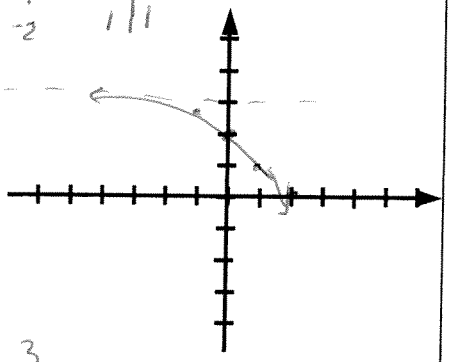
x	y
-1	$\frac{1}{2}$
0	1
1	2

flip over x-axis

x	y
-1	$-\frac{1}{2}$
0	-1
1	-2

up 3

x	y
-1	$2\frac{1}{2}$
0	2
1	1



Asymptote: $y = 3$

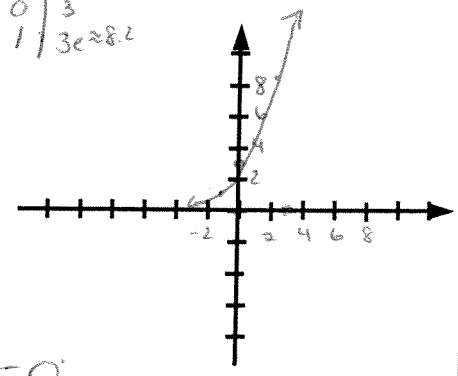
Domain: $(-\infty, \infty)$ Range: $y < 3$ $(-\infty, 3)$

9. $f(x) = 3e^x$

x	y
-1	$\frac{1}{e}$
0	1
1	e

Mult y's by 3

x	y
-1	$\frac{3}{e} \approx 1.1$
0	3
1	$3e \approx 8.2$



Asymptote: $y = 0$

Domain: $(-\infty, \infty)$ Range: $y > 0$ $(0, \infty)$

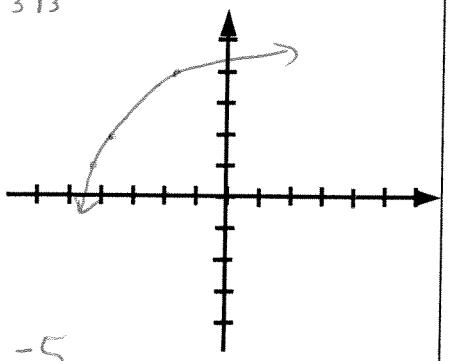
10. $f(x) = \log_3(x + 5) + 2$

x	y
-1	$\frac{1}{3}$
0	1
1	3

x	y
$\frac{1}{3}$	-1
1	0
3	1

x	y
$\frac{1}{3}$	1
1	2
3	3

x	y
$-4\frac{1}{3}$	1
-4	2
-2	3



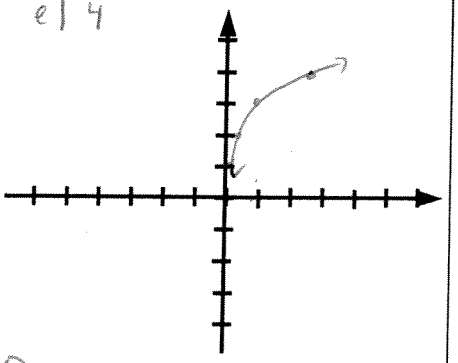
Asymptote: $x = -5$

Domain: $(-5, \infty)$ Range: $(-\infty, \infty)$

11. $f(x) = 3 + \ln x$

x	y
$\frac{1}{e}$	-1
1	0
e	1

x	y
$\frac{1}{e}$	2
1	3
e	4



Asymptote: $x = 0$

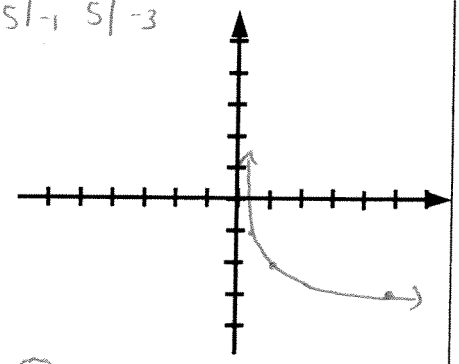
Domain: $(0, \infty)$ Range: $(-\infty, \infty)$

12. $f(x) = -2 - \log_5 x$

x	y
$\frac{1}{5}$	1
1	0
5	-1

x	y
$\frac{1}{5}$	-1
1	0
5	1

x	y
$\frac{1}{5}$	-1
1	-2
5	-3



Asymptote: $x = 0$

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