Remember the MAPPING NOTATION: $(x, y) \rightarrow (\frac{x}{k} + d, ay + c)$

MOTHER CHILD

step2

$a = 2$ $k = 2$ * $y = 1$

* $c = 1$ $d = 0$

$(x,y) \rightarrow (\frac{x}{2} + 0, 2y + 1)$

$A(-2, 1/4) \rightarrow A'(\frac{-2}{2}, 2 \cdot \frac{1}{4} + 1) = (-1, 1.5)$

$B(-1, 1/2) \rightarrow B'(\frac{-1}{2}, 2 \cdot \frac{1}{2} + 1) = (-0.5, 2)$

$C(0, 1) \rightarrow C'(\frac{0}{2}, 2 \cdot 1 + 1) = (0, 3)$

$D(1, 2) \rightarrow D'(\frac{1}{2}, 2 \cdot 2 + 1) = (0.5, 5)$

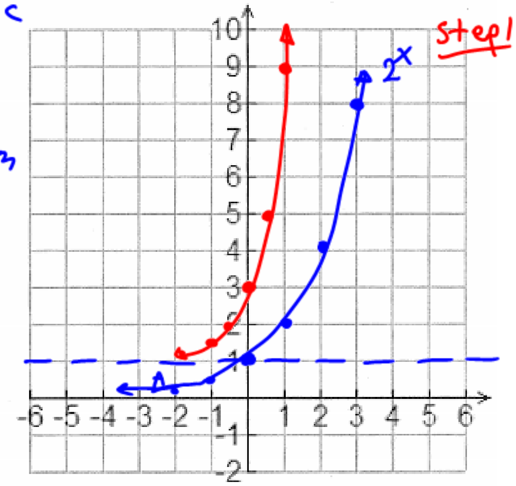
$E(2, 4) \rightarrow E'(\frac{2}{2}, 2 \cdot 4 + 1) = (1, 9)$

$F(3, 8) \rightarrow F'(\frac{3}{2}, 2 \cdot 8 + 1) = (1.5, 17)$

$f(x) = 2[2]^{2x} + 1$

k, c, a, asym

$f(x) = 2[2^{2x}] + 1$



Graph these exponential functions:

mother child

step2 $(x, y) \rightarrow (\frac{x}{k} + d, ay + c)$

$a = -2$ $k = -2$ * $y = -1$ asymptote

$c = -1$ $d = +2$

step3 $(x,y) \rightarrow (\frac{x}{-2} + 2, -2y - 1)$

$A(-3, 8) \rightarrow A'(\frac{-3}{-2} + 2, -2(8) - 1) = (3.5, -17)$

$B(-2, 4) \rightarrow B'(\frac{-2}{-2} + 2, -2(4) - 1) = (3, -9)$

$C(-1, 2) \rightarrow C'(\frac{-1}{-2} + 2, -2(2) - 1) = (2.5, -5)$

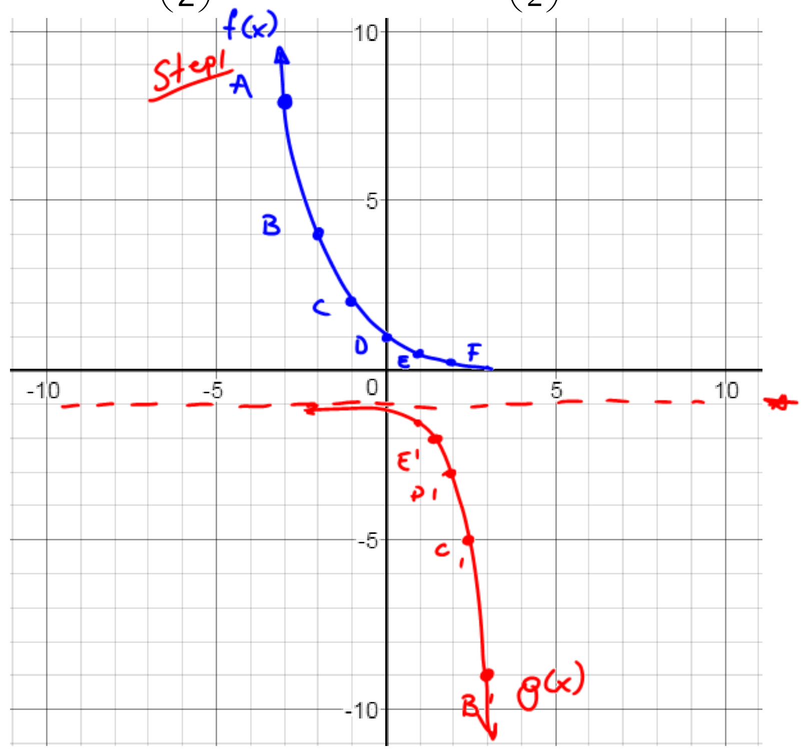
$D(0, 1) \rightarrow D'(\frac{0}{2} + 2, -2(1) - 1) = (2, -3)$

$E(1, 1/2) \rightarrow E'(\frac{1}{-2} + 2, -2(\frac{1}{2}) - 1) = (1.5, -2)$

$F(2, 1/4) \rightarrow F'(\frac{2}{-2} + 2, -2(\frac{1}{4}) - 1) = (1, -1.5)$

↓8 ↓4 ↓2 ↓1 ↓0.5

a) $f(x) = \left(\frac{1}{2}\right)^x$ b) $g(x) = -2\left(\frac{1}{2}\right)^{-2(x-2)} - 1$



y-int can be found by merely subbing "0" for "x".

$y = -2\left(\frac{1}{2}\right)^{-2(0-2)} - 1$

$= -2\left(\frac{1}{2}\right)^{+4} - 1$

$= -2\left(\frac{1}{16}\right) - 1$

$= -\frac{1}{8} - 1$

$= -9/8$

$\therefore$ y-int $(0, -9/8)$

Graph b	
Asymptote:	$y = -1$
y-intercept:	$(0, -9/8)$
Domain:	$\{x \in R\}$
Range:	$\{y \in R \mid y < -1\}$

EXTRA PRACTICE

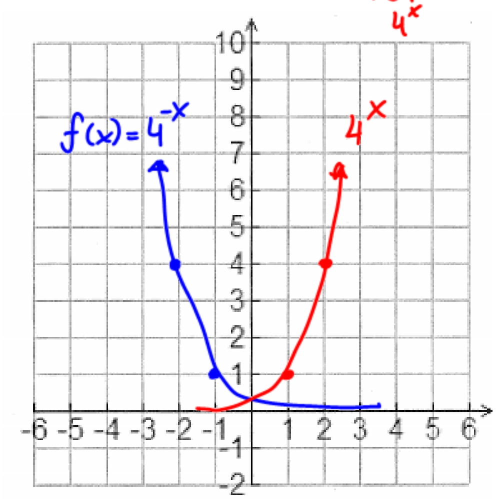
Now graph these, trying to notice some tips/tricks.

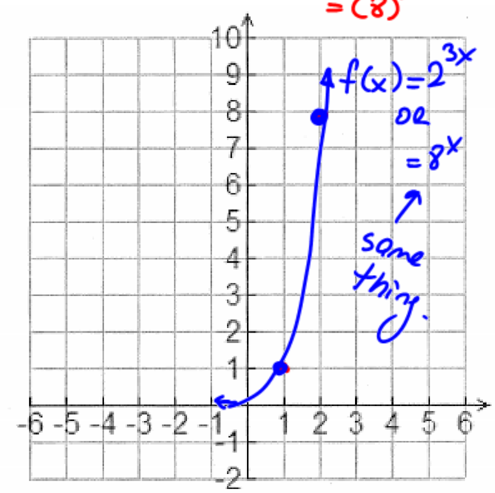
$f(x)=4^{-x}$ ← horizontally reflect 4^x

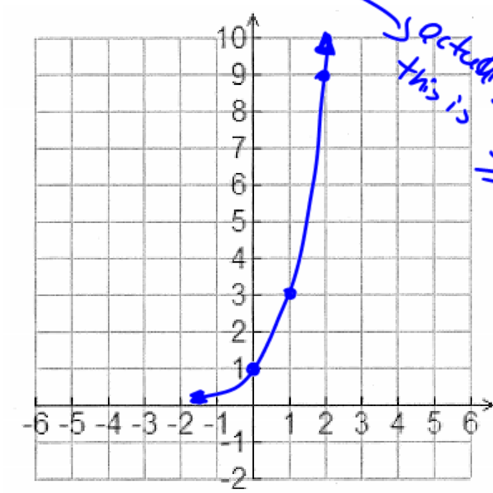
$f(x)=2^{3x} = (2^3)^x = (8)^x$

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

$f(x)=\frac{1}{3}\left(3^{x+1}\right)$ → actually, this is 3^x





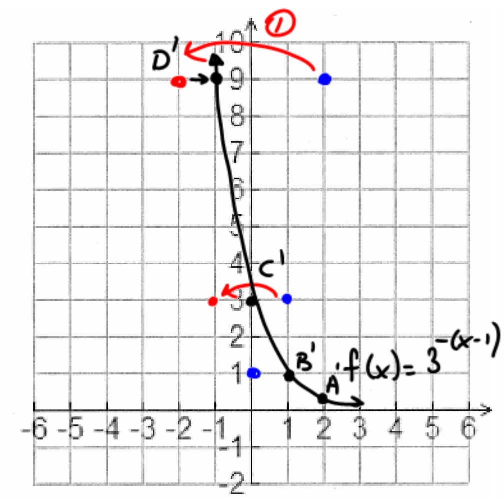


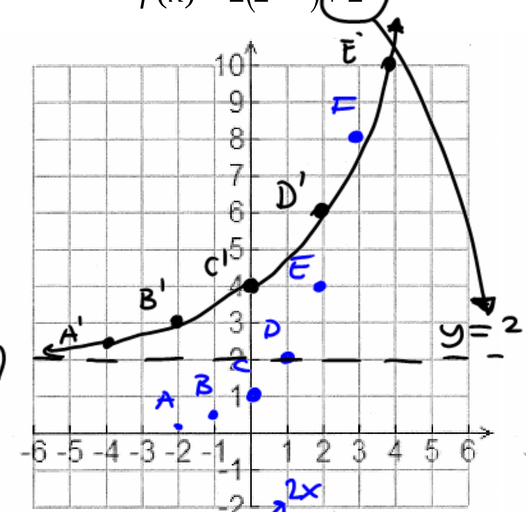
graph 3^x, then horizontal reflect and move 1 right

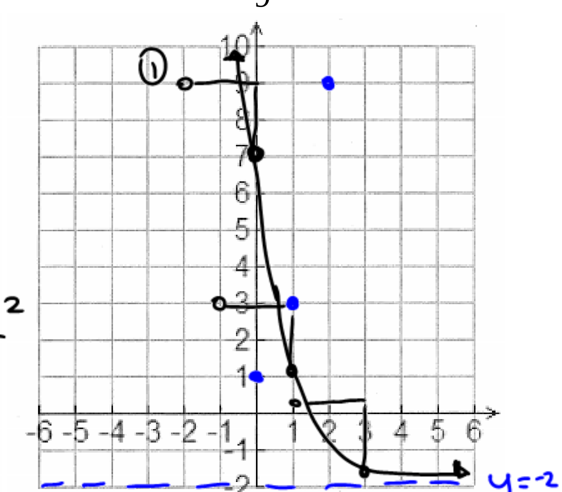
$f(x)=3^{-(x-1)}$

$f(x)=2\left(2^{0.5x}\right)+2$

$f(x)=\frac{1}{9}\left(3^{-x}\right)-2$







OR

$(x,y) \rightarrow \left(\frac{x}{-1}+1,\ y+0\right)$

$A(-1, 1/3) \rightarrow A'\left(\frac{-1}{-1}+1, \frac{1}{3}\right) = (2, 1/3)$

$B(0,1) \rightarrow B'\left(\frac{0}{-1}+1, 1\right) = (1,1)$

$C(1,3) \rightarrow C'\left(\frac{1}{-1}+1, 3\right) = (0,3)$

$D(2,9) \rightarrow D'\left(\frac{2}{-1}+1, 9\right) = (-1,9)$

$(x,y) \rightarrow \left(\frac{x}{0.5}+0,\ 2y+2\right)$ ($2x$)

$A(-2, 1/4) \rightarrow A'\left(2(-2), 2\cdot\frac{1}{4}+2\right) = (-4, 2.5)$

$B(-1, 1/2) \rightarrow B'\left(2(-1), 2\cdot\frac{1}{2}+2\right) = (-2, 3)$

$C(0,1) \rightarrow C'(0, 2\cdot 1+2) = (0,4)$

$D(1,2) \rightarrow D'(2\cdot 1, 2\cdot 2+2) = (2,6)$

$E(2,4) \rightarrow E'(2\cdot 2, 4\cdot 2+2) = (4,10)$

$f(x)=\frac{1}{9}\left(3^{-x}\right)-2$

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

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

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

Asymptote: $y=0$
y-intercept: $(0,3)$
Domain: $\{x\in\mathbb{R}\}$
Range: $\{y\in\mathbb{R} \mid y>0\}$

Asymptote: $y=2$
y-intercept: $(0,4)$
Domain: $\{x\in\mathbb{R}\}$
Range: $\{y\in\mathbb{R} \mid y>2\}$

Asymptote: $y=2$
y-intercept: $(0,7)$
Domain: $\{x\in\mathbb{R}\}$
Range: $\{y\in\mathbb{R} \mid y>2\}$

$f(x)=\frac{1}{4}\left(4^{x+3}\right) \to = 4^{-1}\left(4^{x+3}\right)$

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

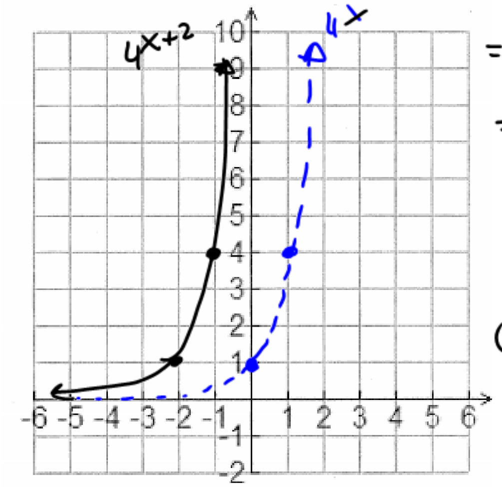
$= 4^{x+2}$

y-int

$y = 4^{0+2}$

$= 4^2$

$= 16$



Asymptote: $y=0$

y-intercept: $(0,16)$

Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid y>0\}$

$f(x)=2(2^{2x})-2$

$(x,y) \to \left(\frac{x}{2}, 2y-2\right)$

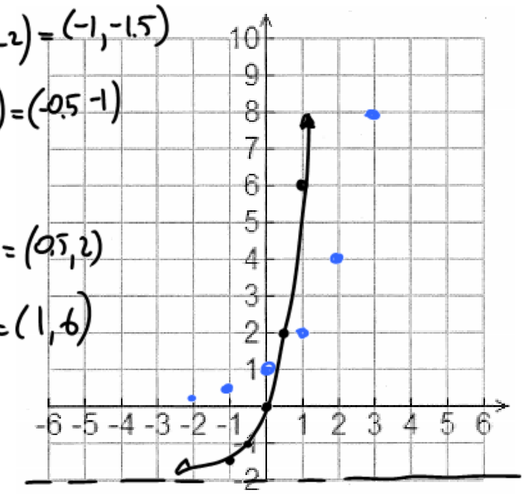
$A(-2, \frac{1}{4}) \to \left(\frac{-2}{2}, 2\cdot\frac{1}{4}-2\right) = (-1,-1.5)$

$B(-1, \frac{1}{2}) = \left(\frac{-1}{2}, 2\cdot\frac{1}{2}-2\right) = (-0.5,-1)$

$C(0,1) = (0,0)$

$D(1,2) = \left(\frac{+1}{2}, 2\cdot 2-2\right) = (0.5, 2)$

$E(2,4) = \left(\frac{2}{2}, 4\cdot 2-2\right) = (1,6)$



Asymptote: $y=-2$

y-intercept: $(0,0)$

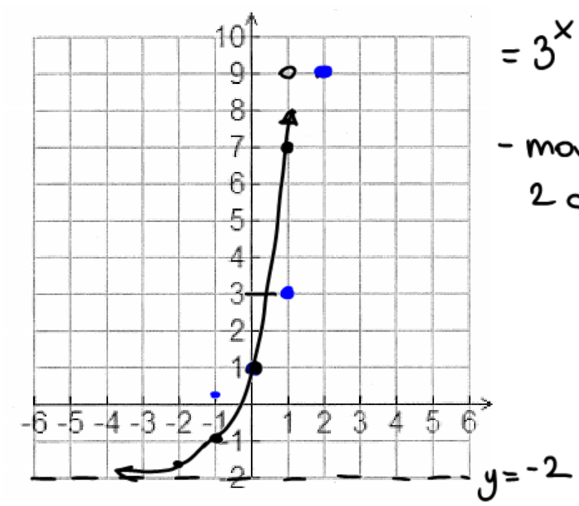
Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid y>-2\}$

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

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

- move 1 left
  2 down



Asymptote: $y=-2$

y-intercept: $(0,1)$

Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid y>-2\}$

$f(x)=-\frac{1}{9}\left(3^{2(x+1)}\right)+2$

$= -3^{-2}\cdot 3^{2x+2}+2$

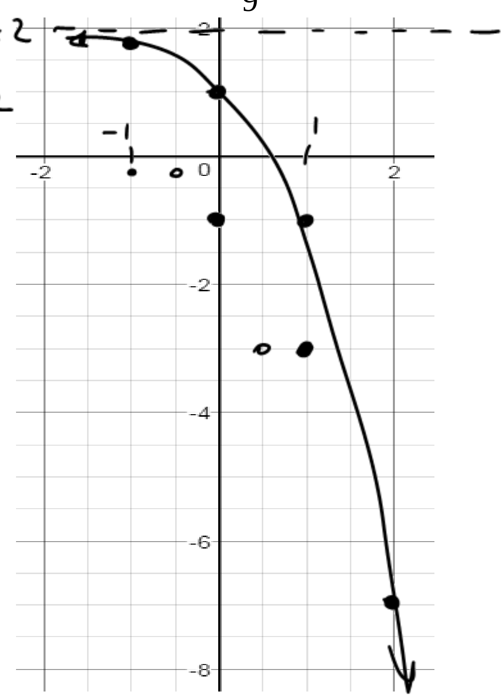
$= -3^{2x+2-2}+2$

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

① Reflect 3^x vertically

② halve "x"

③ 2 units up



Asymptote: $y=2$

y-intercept: $(0,1)$

Domain: $\{x \in \mathbb{R}\}$

Range: $\{y \in \mathbb{R} \mid y<2\}$