

Exponential Equations

What does an exponential function look like?

ex)

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

stretch factor

translations

$$\rightarrow 2$$

$$g(x) = a \cdot b^{x-2}$$

$$\downarrow 5$$

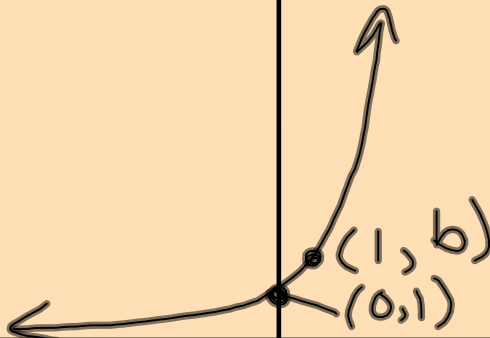
$$h(x) = a \cdot b^x - 5$$

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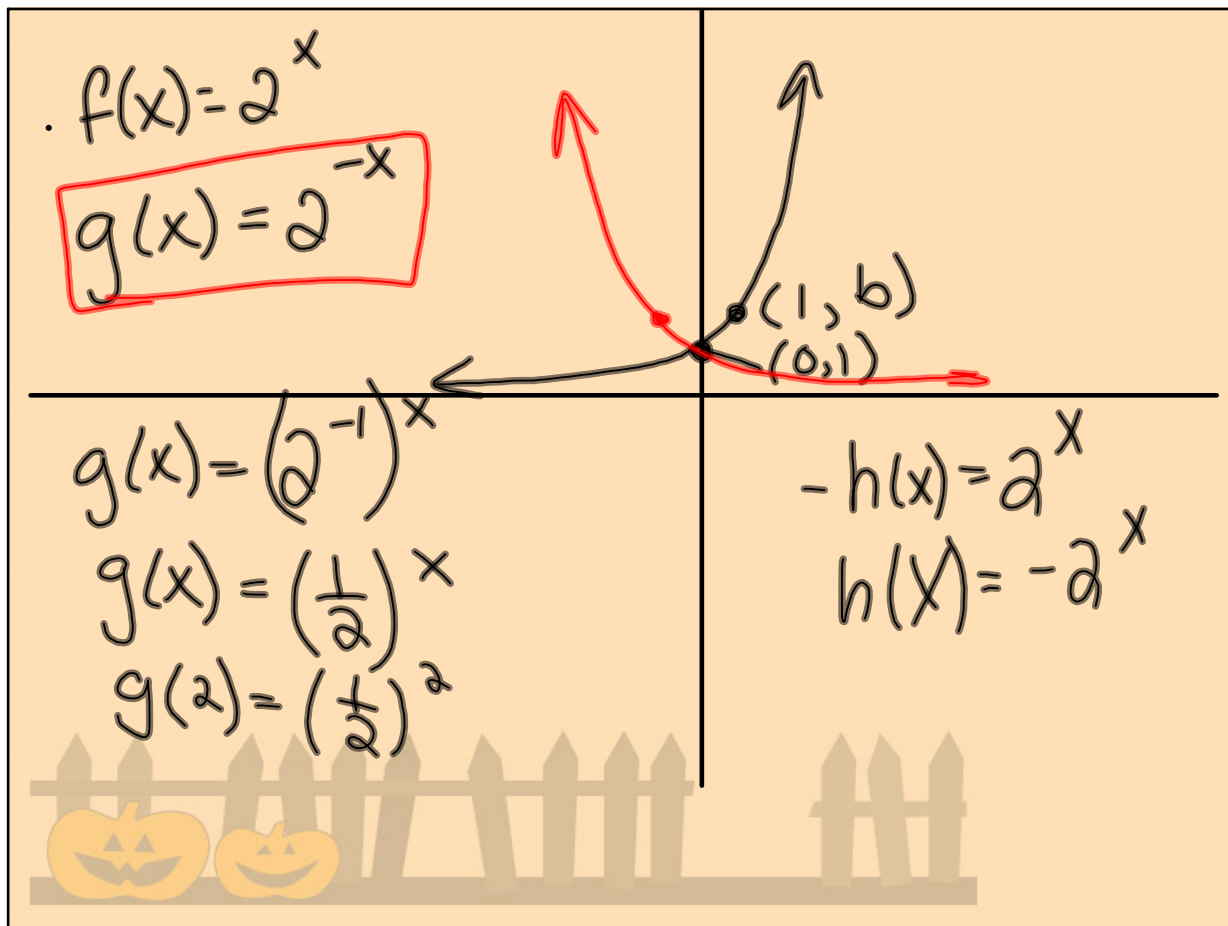
$$f(x) = 2^x$$

$$f(0) = 2^0 = 1$$

$$f(1) = 2^1 = 2$$



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Rules of exponents

$$a^1 = a$$

$$a^0 = 1$$

$$a^x \cdot a^y = a^{x+y}$$

$$\frac{a^x}{a^y} = a^{x-y}$$

$$(a^x)^y = a^{xy}$$

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$$\frac{X^3}{X^5} = X^{-2}$$

$$\frac{\cancel{X} \cancel{X} \cancel{X}}{\cancel{X} \cancel{X} \cancel{X} X X} = \frac{1}{X^2}$$



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$$\sqrt{X^1} = X^{\frac{1}{2}}$$

$$\left(X^{\frac{1}{2}} \right) \left(X^{\frac{1}{2}} \right) = X^1$$

$$\sqrt{X} \sqrt{X} = X$$

$$X^{\frac{1}{3}} X^{\frac{1}{3}} X^{\frac{1}{3}} = X^1$$

$$\sqrt[3]{X} \sqrt[3]{X} \sqrt[3]{X} = X$$



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$$\begin{aligned}125^{-\frac{2}{3}} &= 125^{-1 \cdot 2 \cdot \frac{1}{3}} \\ &= 5^{-1 \cdot 2} \\ &= 25^{-1} \\ &= \frac{1}{25}\end{aligned}$$



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$$\begin{aligned}(-8)^{-\frac{5}{3}} &= (-8)^{-1 \cdot 5 \cdot \frac{1}{3}} \\ &= (-2)^{-1 \cdot 5} \\ &= -32^{-1} \\ &= \frac{1}{-32} = -\frac{1}{32}\end{aligned}$$



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Exercise 4B

1 Evaluate

a $9^{\frac{1}{2}} = 3$

b $125^{\frac{1}{3}} = 5$

c $64^{\frac{2}{3}} = (64^{\frac{1}{3}})^2 = 16$

d $8^{\frac{2}{3}} = (8^{\frac{1}{3}})^2 = 4$

e $(\frac{8}{27})^{\frac{2}{3}} = (\frac{8^{\frac{1}{3}}}{27^{\frac{1}{3}}})^2 = (\frac{2}{3})^2 = \frac{4}{9}$

2 Evaluate

a $2^{-3} = \frac{1}{8}$

b $32^{-\frac{2}{5}} = \frac{1}{32^{\frac{2}{5}}} = \frac{1}{(32^{\frac{1}{5}})^2} = \frac{1}{2^2} = \frac{1}{4}$

c $81^{-\frac{1}{4}} = \frac{1}{81^{\frac{1}{4}}} = \frac{1}{3}$


d $(2^3)^{-\frac{4}{3}} = 2^{3 \cdot -\frac{4}{3}} = 2^{-4} = \frac{1}{16}$

e $(\frac{64}{125})^{-1 \cdot 2 \cdot \frac{1}{3}} = (\frac{64}{125})^{-\frac{2}{3}} = (\frac{4}{5})^{-1 \cdot 2} = \frac{25}{16}$

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$2^1 = 2$
 $2^2 = 4$
 $2^3 = 8$
 $2^4 = 16$
 $2^5 = 32$
 $2^6 = 64$
 $2^7 = 128$

$1^3 = 1$
 $2^3 = 8$
 $3^3 = 27$
 $4^3 = 64$
 $5^3 = 125$



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