Exponential Function
A function that can be rewritten in the form $y = a \cdot b^x$, where a is non-zero, b is positive, and $b \neq 1$.
a: initial value at x= 0
b: base

Which of the following are exponential functions?
For those that are exponential functions, state the initial value and the base. For those that are not, explain.

$f(x) = 1 \cdot 3^x$

A) $f(x) = 3^x$

Yes exponential
Intial Value = 1
base = 3

B) $g(x) = 6x^{-4}$

$\frac{6}{x^4}$

No, not in form of $y = cb^x$

C) $h(x) = -2 \cdot 1.5^x$

Yes
Initial value = -2
Base 1.5

D) $h(x) = 7 \cdot -2^x$

Not exponential
b is negative

E) $f(x) = 5 \cdot 6^x$

Yes Exponential
Initial Value = 5
Base = 6

Compute the exact value of the function without using a calculator

A) $2 \cdot 4^x$ when x = 0

$2 \cdot 4^0$
$2 \cdot 1$
2

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

B) $2 \cdot 4^x$ when x = -3

$2 \cdot 4^{-3} = \frac{2}{4^3}$
$= \frac{2}{64} = \frac{1}{32}$

$4^{\frac{1}{2}} = \sqrt{4}$

C) $-2 \cdot 4^x$ when x = 1/2

$-2 \cdot 4^{1/2}$
$-2 \cdot \sqrt{4}$
$-2 \cdot 2$
-4

Power
$8^{2/3}$ → root
$(\sqrt[3]{8})^2$
$(2)^2$
4

D) $3 \cdot 8^x$ when x = -2/3

$3 \cdot 8^{-2/3}$
$\frac{3}{8^{2/3}} = \frac{3}{4}$

$\frac{3}{4}$

Determine a formula for the exponential function g(x) and h(x) whose values are given in the table

x	g(x)		x	h(x)
-2	4/9		-2	128
-1	4/3		-1	32
0	4		0	8
1	12		1	2
2	36		2	1/2

$g(x) = ab^x$

$a = 4 \rightarrow$ intial Value

$g(x) = 4b^x$

$12 = 4b^1$

$b = 3$

$g(x) = 4 \cdot 3^x$

$36 = 4b^2$

$9 = b^2$

$b = 3$

$h(x) = ab^x$

$a = 8$

$h(x) = 8b^x$

$2 = 8b^1$

$\frac{2}{8} = b$

$b = \frac{1}{4}$

$h(x) = 8 \cdot \left(\frac{1}{4}\right)^x$

Given 2 points on the graph of an exponential function, find the formula

A) (0, 2) (2, 18)

$x \downarrow \quad \leftarrow f(x)$

$a = 2$

$f(x) = ab^x$

$f(x) = 2b^x$

$18 = 2b^2$

$9 = b^2$

$b = 3$

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

B) (0,3) $\left(3, \frac{3}{e}\right)$

$g(x) = 3b^x$

$\frac{\cancel{3}}{\cancel{3}e}$ $\quad \frac{1}{3} \cdot \frac{\frac{3}{e}}{3} = \frac{3b^3}{3}$

$\sqrt[3]{\frac{1}{e}} = \sqrt[3]{b^3}$

$\frac{1}{\sqrt[3]{e}} = b$

$\frac{1}{e^{1/3}}$

$e^{-1/3} = b$

$g(x) = 3 \cdot \left(e^{-1/3}\right)^x$