Finding EQs: Linear/Exponential

Linear: $y = mx + b$

Exponential: $y = a \cdot b^x$

Although there are some "tricks" to finding the equation, you can always plug in points & solve for the parameters.

Ex 1 (0, −3) & (10, −300)

Linear: $y = mx + b$

$-3 = m(0) + b \longrightarrow -3 = b$

$-300 = m(10) + b$

$-300 = m(10) - 3$

$-297 = m(10)$

$-29.7 = m$

$$y = -29.7x - 3$$

Exponential: $y = a \cdot b^x$

$-3 = a \cdot b^0 \longrightarrow -3 = a$

$-300 = a \cdot b^{10}$

$-300 = -3 \cdot b^{10}$

$100 = b^{10}$

$100^{1/10} = b$

$y = -3(100^{1/10})^x$ OR $y = -3(100)^{x/10}$

Those examples were easier because I gave you the y-intercept.

Notice that in $y=mx+b$, $b=$ y-int, and that in $y=a\cdot b^x$, $a=$ y-int.

Ex 2 (1, 123), (7, 456)

Linear: (use elimination)

$123 = m\cdot 1 + b$

$-(456 = m\cdot 7 + b)$

$-333 = -6m$

$55.5 = m$

$y = 55.5x + b$

$123 = 55.5(1) + b$

$67.5 = b$

$y = 55.5x + 67.5$

Exponential:

$123 = a\cdot b^1 \rightarrow a = \frac{123}{b}$

$456 = a\cdot b^7$ (Solve for a, then plug in)

$456 = \frac{123}{b}\cdot b^7$

$456 = 123\cdot b^6$

$\frac{456}{123} = b^6$

$\left(\frac{456}{123}\right)^{1/6} = b \approx 1.244$ (Solve for b. Use answer to find a)

(Because $a=\frac{123}{b}$) $a = \frac{123}{\left(\frac{456}{123}\right)^{1/6}} \approx 98.87$

$y = 98.87\cdot 1.244^x$