1. a) $t = 3$

Final amount = 90
Initial amount = 400
solving for k.

$$\frac{90}{400} = \frac{400e^{-k(3)}}{400}$$ ← Variable in exponent. switch to log

$$\Rightarrow \frac{9}{40} = e^{-3k} \Rightarrow \frac{\log_e \frac{9}{40}}{-3} = \frac{-3k}{-3} \Rightarrow \frac{\ln(\frac{9}{40})}{-3} = k$$

$$.497 = k$$ (3 decimal places)

put back in formula for complete function $\boxed{C(t) = 400e^{-4.97t}}$

b) $t = 3$
Final amount: 120
Initial amount: ?

$$120 = A_0 e^{-.6(3)}$$

↑ missing: try to get alone. Divide both sides by $e^{-.6(3)}$

$$\frac{120}{e^{-.6(3)}} = \frac{A_0 e^{-.6(3)}}{e^{-.6(3)}}$$

↑ Put in calculator correctly!!

$$725.96 = A_0$$ ↑ round

$$\boxed{726 = A_0}$$

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2. a) * composition ← put one function inside another.

We want $A =$ (something w/ "t" and no "r".) plug in $\sqrt{\frac{400}{t+2}}$ for "r"

$$A = \pi\left(\sqrt{\frac{400}{t+2}}\right)^2$$

$$A(t) = \pi \cdot \frac{400}{t+2}$$

$$\Rightarrow \boxed{A(t) = \frac{400\pi}{t+2}}$$

b) When *$A = 40$ find (solve for) "t"

$$40 = \frac{400\pi}{(t+2)}$$

$$(t+2)40 = 400\pi \Rightarrow 40t + 80 = 400\pi \Rightarrow \frac{40t}{40} = \frac{400\pi - 80}{40}$$

$$t = \frac{(400\pi - 80)}{40}$$

$$\boxed{t = 29.4 \text{ days}}$$

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3. * INVERSE (switch x + y, solve for y)

a) $x = \frac{2000}{y} + 400$ (-400 -400)

$$\Rightarrow y(x-400) = \frac{2000}{y} \cdot y \Rightarrow \frac{y(x-400)}{(x-400)} = \frac{2000}{(x-400)} \Rightarrow \boxed{y = \frac{2000}{x-400}}$$

b) plug in 455 gallons... to what?? *Think... $f(x)$: input = days, output = # of gallons. SO... $f^{-1}(x)$: input = # gallons, output = days ... plug in 455 into inverse and it will give you days.

$$\text{days} = \frac{2000}{(455-400)} = \frac{2000}{55} = \boxed{36.4 \text{ days}}$$