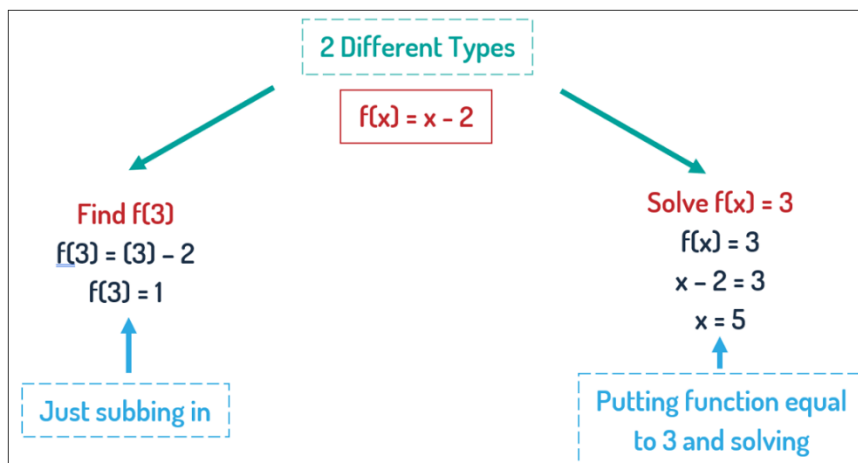


## NICKS & TRICKS

### LCHL Guide to - Functions

#### 1. Never Make this mistake – Sub in Correctly



#### 2. Most of Functions are about **Subbing In & Using Algebra.**

Think of functions like an oven  
You put something in, and you get something else out.

# Worked Example

Ciarán is preparing food for his baby and must use cooled boiled water. The equation  $y = Ae^{kt}$  describes how the boiled water cools. In this equation: •  $t$  is the time, in minutes, from when the water boiled, •  $y$  is the difference between the water temperature and room temperature at time  $t$ , measured in degrees Celsius, •  $A$  and  $k$  are constants. The temperature of the water when it boils is  $100^{\circ}\text{C}$  and the room temperature is a constant  $23^{\circ}\text{C}$ .

**(i) Find the values of  $A$ .**

$$\begin{aligned} @t = 0 \\ y &= 100 - 23 \\ y &= 77 \\ y &= Ae^{kt} \\ 77 &= Ae^{(k)(0)} \\ 77 &= Ae^0 \\ 77 &= A(1) \\ 77 &= A \end{aligned}$$

**(ii) After five minutes, the temperature of the water is  $88^{\circ}\text{C}$ . Find the value of  $k$ , correct to three significant figures..**

$$\begin{aligned} @t = 5 \\ y &= 88 - 23 \\ y &= 65 \\ y &= 77e^{kt} \\ 65 &= 77e^{(k)(5)} \\ 65 &= 77e^{5k} \\ \frac{65}{77} &= e^{5k} \\ 5k &= \ln \frac{65}{77} \\ k &= \frac{\ln \frac{65}{77}}{5} \\ k &= -0.03388 \\ k &\approx -0.0339 \end{aligned}$$

**Hint: Insert in Logs to deal with unknown powers**

## 2021 Question – 15 mins – Time yourself!

A cup of coffee is freshly brewed to  $95^{\circ}\text{C}$ .

The temperature,  $T$ , in degrees centigrade, of the coffee as it cools is given by the formula

$$T(t) = Ae^{-0.081t} + 20$$

where  $A$  is constant and  $t$  is time measured in minutes from when the coffee was brewed.

- (i) Show that  $A = 75$ .

- (ii) Explain what the value 20 in the formula represents in the context of the coffee cooling.

- (iii) Find the **decrease** in the temperature of the coffee 10 minutes after brewing.  
Give your answer correct to the nearest whole number.

