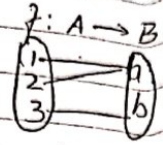
Calculus:

Function(f): is a rule which associates every element of set A to a unique element of set B.

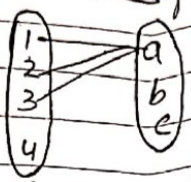
Eg:

i) $f: A \to B$



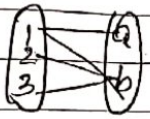
∴ It is a function.

ii)



∴ It is not a function because 4 does not have an image.

iii)



∴ It is not a function as 1 does not have a unique image.

iv) $f(x) = 2x+3$ is a function on Natural nos.

v) $x = f(p)$ is a demand function, where $x \to$ quantity, $p \to$ price.

Limit of a function:

$f(x)$ is said to have a limit as $x \to a$ if $\lim_{x \to a^+} f(x) = f(a) = \lim_{x \to a^-} f(x)$

Properties of limits

- $\lim_{x \to a} (f(x) \pm g(x)) = \lim_{x \to a} f(x) \pm \lim_{x \to a} g(x)$
- $\lim_{x \to a} (f(x)\, g(x)) = \lim_{x \to a} f(x) \cdot \lim_{x \to a} g(x)$
- $\lim_{x \to a} \left[\frac{f(x)}{g(x)}\right] = \frac{\lim_{x \to a} f(x)}{\lim_{x \to a} g(x)}$

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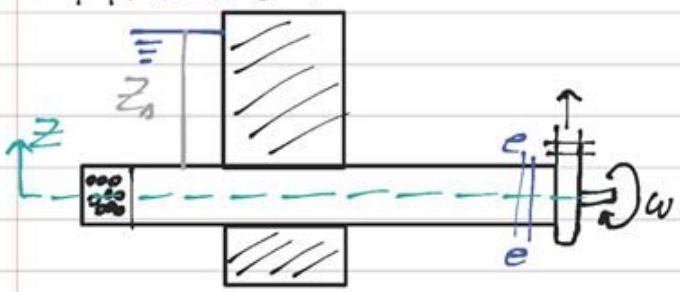

$$Z_s + \left(\frac{P_s}{\rho g}\right)_{abs} + \frac{V_s^2}{2g} = Z_e + \frac{V_e^2}{2g} + \left(\frac{P_e}{\rho g}\right)_{abs} + \Delta H_s \Leftrightarrow$$

$$\left[\left(\frac{P_e}{\rho g}\right)_{abs} + \frac{V_e^2}{2g} - \frac{P_v}{\rho g}\right] = \left(\frac{P_{atm}}{\rho g}\right)_{abs} + Z_s - \Delta H_s$$

$$NPSH_{disp.} = \left(\frac{P_{atm}}{\rho g}\right)_{abs} + \Delta Z - \Delta H_s - \frac{P_v}{\rho g}$$

* Dicas: $(P_{abs})_{atm} = \rho_{Hg} \cdot g \cdot h_{Hg} = 13600 \cdot 9,81 \cdot 0,76 = 101361\ Pa$

$$\left(\frac{P_{atm}}{\rho g}\right)_{abs} = \frac{101361}{1000 \cdot 9,81} = 10,33\ m \quad ; \quad \left(\frac{P_{atm}}{\rho g}\right) = 10,33 - \frac{Z}{900}$$

↳ $\left(\frac{P_v}{\rho g}\right) = 0,077 \cdot e^{0,0558 \cdot \Theta}$, com Θ em °C

↳ Diâmetro ótimo da flange de sucção: $D_{ótimo} = 4,5 \cdot \sqrt[3]{\frac{Q}{n}}$
com Q em m^3/s ; n em rpm ; D em m

↳ $NPSH_{req} \cong 0,203 \cdot w_s^{4/3} \cdot \frac{H^*}{\eta_{máx}}$; $w_s = w \cdot \frac{\sqrt{Q^*}}{(gH^*)^{3/4}}$