

3)

a) $F(x) = x \sin(x)$

$$x \sin(x) = x$$

$$x \sin(x) - x = 0$$

$$x(\sin(x) - 1) = 0$$

① $x=0$

$$F(0) = 0 \cdot \sin(0) = 0$$

② $\sin(x) - 1 = 0$

$$\sin(x) = 1$$

$$x = \frac{\pi}{2} + 2K\pi, K \in \mathbb{Z}$$

Pontos fixos: $x=0$ e $x = \frac{\pi}{2} + 2K\pi$ Derivada: $F'(x) = \sin(x) + x \cos(x)$

$$|F'(x)| < 1$$

① $x=0$

$$F'(0) = \sin(0) + 0 \cdot \cos(0) = 0$$

 $|F'(0)| = 0 < 1$ ✓ converge rápido (PONTO FIXO ATRATOR)
 $x=0$

② $x = \frac{\pi}{2} + 2K\pi$

$$\sin(x) = 1 \quad \cos(x) = 0$$

$$F'(x) = 1 + x \cdot 0 = 1$$

$$|F'(x)| = 1$$

X convergência não é garantida (instável)

b) $F(x) = x^2 - \frac{x}{2}$

$$x^2 - \frac{x}{2} = x$$

$$x^2 - \frac{x}{2} - x = 0$$

$$x\left(x - \frac{3}{2}\right) = 0$$

① $x=0$

$$F(0) = 0^2 - \frac{0}{2} = 0$$

② $x - \frac{3}{2} = 0 \rightarrow x = \frac{3}{2}$

$$F\left(\frac{3}{2}\right) = \left(\frac{3}{2}\right)^2 - \frac{1}{2} \cdot \frac{3}{2} = \frac{3}{2}$$

Pontos fixos: $x=0$ e $x = \frac{3}{2}$ Derivada: $F'(x) = 2x - \frac{1}{2}$

$$|F'(x)| < 1$$

① $x=0$

$$F'(0) = 0 - \frac{1}{2} = -\frac{1}{2}$$

$$|F'(0)| < 1$$

(PONTO FIXO ATRATOR)
 $x=0$

② $x = \frac{3}{2}$

$$F'\left(\frac{3}{2}\right) = 3 - \frac{1}{2} = 2,5$$

X (PONTO FIXO REPULSOR)

$$|F'\left(\frac{3}{2}\right)| > 1$$