2.) $y'(x) = (1+x)(1+y^2)$

$$\frac{y'(x)}{1+y^2} = (1+x)$$

[redacted]

$$\Rightarrow \arctan(y) = x + \frac{x^2}{2} + C$$

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$\boxed{\text{5:00 PM - solutions}}$

1.) $$\begin{cases} y(t) = t(y' - t\cos t) \\ y(\frac{\pi}{2}) = 0 \end{cases}$$

(i) order $= 1$

linear, inhomogeneous deq.

(ii) homog. eq. (gen. sol.):

$$y_h(t) - t y_h' = 0$$

$$\frac{y_h'}{y_h} = \frac{1}{t}$$

$$\ln|y_h| = \ln|t| + D$$

$$\Rightarrow y_h(t) = Ct, \quad C \in \mathbb{R}.$$

inhomog. eqn. (variation of constant):

$$y(t) = C(t)\,t$$

$$\Rightarrow \cancel{C(t)}t - t(C'(t)t + \cancel{C(t)}) = -t^2\cos t$$

$$-t^2 C'(t) = -t^2 \cos t$$

$$C'(t) = \cos t$$

since $0 = y(\frac{\pi}{2}) = C(\frac{\pi}{2})\frac{\pi}{2}$

$$\Rightarrow C(\tfrac{\pi}{2}) = 0$$

$$\Rightarrow C(t) = (\sin t - 1) \Rightarrow \underline{y(t) = (\sin t - 1)t}$$