QUESTION 2 [20 marks]

(a) Show that the $\frac{dy}{dx}=\frac{xy\ln(10)-y}{x+e^{y}xy\ln(10)}$ and $\frac{dx}{dy}=\frac{x+e^{y}xy\ln(10)}{xy\ln(10)-y}$ for equation $\log_{10}(xy)+e^{y}=x$. (5 marks)

(b) Assuming that the following equations define x and y implicitly as differentiable functions $x=f(t)$ and $y=g(t)$, find $\frac{dy}{dx}$ at $t=\pi$.

$$x\cos(t)+2x=t \qquad\qquad t\tan(t)-2t=y$$ (10 marks)

Ans: $\frac{dy}{dx}=\frac{\tan(t)+t\sec^{2}(t)-2}{\frac{1+x\sin(t)}{\cos(t)+2}}$ $\qquad$ $\frac{dy}{dx}(\pi)=\pi-2$

(c) The $f'(x)$ for $f(x)=(3x^{4}+5x^{2})^{2}$ is $72x^{7}+180x^{5}+100x^{3}$. Verify it using Quotient Rule. (5 marks)

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