MAT2705-02/03 06S Quiz 1 Print Name (Last, First) _____

Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use arrows and equal signs when appropriate. Always simplify expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation). Indicate where technology is used and what type (Maple, GC).

1. Write a DE that models the situation: "The acceleration d*v*/d*t* of a Lamborghini is proportional to the difference between 250 km/h and the velocity of the car."

2. $e^{y}\frac{dy}{dx}=1$, $y(0)=0$; $y(x)=\ln(x+C)$.

a) First verify that $y(x)$ satisfies the DE.

b) Then determine a value of the constant C so that $y(x)$ satisfies the given initial conditions.

▶ solution

1. $\frac{dv}{dt} \propto (250-v) \rightarrow \boxed{\frac{dv}{dt}=k(250-v)}$

2.a) $y=\ln(x+C)$ → $\frac{dy}{dx}=\frac{1}{x+C}\underbrace{\frac{d}{dx}(x+C)}_{1+0}=\frac{1}{x+C}$

$e^{y}\frac{dy}{dx}=1 \rightarrow \underbrace{e^{\ln(x+C)}}_{(x+C)}\left(\frac{1}{x+C}\right)=1$ ✓

$=1$

b) $y(0)=\ln(0+C)=\ln C = 0$

$e^{\ln C}=e^{0} \Leftrightarrow \boxed{C=1} \rightarrow \boxed{y=\ln(x+1)}$

always finish by collecting partial results in a single formula (BACKSUBSTITUTE)