

Name: _____

key

Show all work clearly and in order. Please box your answers. 10 minutes.

1. Write
- $f(t)$
- in terms of unit step functions (Heaviside functions) if

$$f(t) = \begin{cases} e^t, & 0 \leq t < 2, \\ 1, & t \geq 2. \end{cases}$$

$$f(t) = e^t - e^t u(t-2) + 1 u(t-2)$$

2. Evaluate
- TWO**
- of the following (using any correct method). Clearly put an X through the problem that you do not want graded (otherwise the first problem worked on will be graded).

(a) $\mathcal{L}\{e^{4t} \sin(2t)\}$ use #9

SOL1:

$$= \mathcal{L}\{\sin(2t)\} \Big|_{s \rightarrow s-4}$$

$$= \frac{2}{s^2 + 4} \Big|_{s \rightarrow s-4}$$

$$= \boxed{\frac{2}{(s-4)^2 + 4}}$$

SOL2: $\mathcal{L}\{e^{4t} \sin(2t)\}$

$$\begin{matrix} \uparrow \\ a=4 \end{matrix} \quad f(t) = \sin(2t)$$

$$F(s) = \frac{2}{s^2 + 4}$$

$$\boxed{\#9} \quad F(s-4) = \boxed{\frac{2}{(s-4)^2 + 4}}$$

(b) $\mathcal{L}\{t u(t-2)\}$ use #10a

$$\begin{matrix} \uparrow \\ f(t) = t \\ f(t+2) = t+2 \end{matrix} \quad a=2$$

$$= e^{-2s} \mathcal{L}\{t+2\}$$

$$= \boxed{e^{-2s} \left(\frac{1}{s^2} + \frac{2}{s} \right)}$$

(c) $\mathcal{L}^{-1}\left\{\frac{e^{-2s}}{s-1}\right\}$ use #10

$$= \mathcal{L}^{-1}\left\{e^{-2s} \left(\frac{1}{s-1}\right)\right\}$$

$$\begin{matrix} \uparrow & \uparrow \\ a=2 & F(s) = \frac{1}{s-1} \end{matrix}$$

$$f(t) = e^t$$

$$f(t-2) = e^{t-2}$$

$$= \boxed{e^{t-2} u(t-2)}$$