Name: _____ (Key) _____

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

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

$$f(t) = e^t - e^t \mathcal{U}(t-2) + 1\mathcal{U}(t-2)$$

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:

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

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

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

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

   $a=4$ $f(t) = \sin(2t)$

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

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

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

   $f(t) = t$ $a = 2$
   $f(t+2) = t+2$

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

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

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

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

   $a=2$ $F(s) = \dfrac{1}{s-1}$

              $f(t) = e^t$

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

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