Math 274	Quiz 14	Name: ______________
25 July 2017	Show Appropriate Work	Point Values in $\boxed{\text{boxes}}$.

1. $\boxed{3}$ Express the following using unit step functions.

$$f(t) = \begin{cases} e^{3t}, & 0 < t < 3 \\ \cos 2t, & 3 < t < 5 \\ 3, & t > 5 \end{cases}$$

$f(t) = e^{3t} + u(t-3)(\cos 2t - e^{3t}) + u(t-5)(3 - \cos 2t)$

2. $\boxed{3}$ Compute the Laplace transform of the following function.

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

$F(s) = \dfrac{1}{s-2} + e^{-2s}\mathcal{L}\{(t+2)^2 - e^{2t+4}\}$

$= \dfrac{1}{s-2} + e^{-2s}\left[\dfrac{2}{s^3} + \dfrac{4}{s^2} + \dfrac{4}{s} - e^4 \cdot \dfrac{1}{s-2}\right]$

3. $\boxed{4}$ Compute the inverse Laplace transform of the following.

$$F(s) = \frac{e^{-2s}(3s^2+s+8)}{(s+1)(s^2+4)}$$

$\dfrac{3s^2+s+8}{(s+1)(s^2+4)} = \dfrac{A}{s+1} + \dfrac{Bs+C}{s^2+4}$

$3s^2+s+8 = A(s^2+4) + (Bs+c)(s+1)$

$s=-1$: $10 = 5A$ so $A=2$

s^2 : $3 = A + B$ so $B=1$

s^0 : $8 = 4A + C$ so $C=0$

$F(s) = e^{-2s}\left[\dfrac{2}{s+1} + \dfrac{s}{s^2+4}\right]$

$= u(t-2)\left[2e^{-(t-2)} + \cos(2(t-2))\right]$