MAT 212, Quiz #11, Spring 2017 Name KEY

Instructions: Show all work. Give exact answers unless specifically asked to round. Be sure to answer all parts of each question.

1. Use the definition of the Laplace transform $F(s) = \int_0^\infty e^{-st} f(t)dt$ to find $\mathscr{L}\{t - 2e^{3t}\}$.

$$\int_0^\infty e^{-st}(t - 2e^{3t})dt = \int_0^\infty te^{-st} - 2e^{-t(s+3)}\,dt$$

$\pm$	u	dv
$+$	t	e^{-st}
$-$	1	$\frac{-1}{s}e^{-st}$
$+$	0	$\frac{1}{s^2}e^{-st}$

$$-t\left(\frac{1}{s}\right)e^{-st} - \frac{1}{s^2}e^{-st} - \frac{2e^{-t(s+3)}}{s+3}\Bigg|_0^\infty$$

$$\left(0 - \frac{1}{s^2}(0) - 0\right) - \left(0 - \frac{1}{s^2} - \frac{2}{s+3}\right) =$$

$$\frac{1}{s^2} + \frac{2}{s+3}$$

2. Use the attached table of Laplace transforms to find:
   a. $\mathscr{L}\{\sin 2t - \cos 3t\}$

   $$\frac{2}{s^2+4} - \frac{s}{s^2+9}$$

   b. $\mathscr{L}\{t^{3/2} - e^{-10t}\}$

   $$\frac{\Gamma(\frac{3}{2}+1)}{s^{5/2}} - \frac{1}{s+10} = \frac{15\sqrt{\pi}}{8s^{5/2}} - \frac{1}{s+10}$$

   c. $\mathscr{L}^{-1}\left\{9 + \frac{s}{4-s^2}\right\}$

   $$9 - \frac{s}{s^2-4}$$

   $$9\delta(t) - \cosh(2t)$$

   d. $\mathscr{L}^{-1}\left\{\frac{2e^{-3s}}{s}\right\}$

   $$2u(t-3)$$