Math 274 Inverse Laplace **Name:** ____________________

Sections: 5.1-5.4 Point values in boxes.

Due: 22 October 2018

1. $\boxed{2}$ Using the provided table of Laplace transforms, show

$$\mathscr{L}\left\{\frac{1}{2}(\sin 3t - 3t\cos 3t)\right\} = \frac{27}{(s^2+9)^2}.$$

2. Determine the inverse Laplace transform of the following.

(a) $\boxed{1}$ $G(s) = \dfrac{3}{2s+1}$

(b) $\boxed{1}$ $H(s) = \dfrac{6}{4-s}$

(c) $\boxed{2}$ $N(s) = \dfrac{s}{s^2+6s+8}$

(d) $\boxed{1}$ $K(s) = \dfrac{7}{(s-3)^6}$

(e) $\boxed{1}$ $M(s) = \dfrac{2s+3}{s^2+2}$

(f) $\boxed{2}$ $N(s) = \dfrac{3s}{s^2-6s+13}$

3. $\boxed{4}$ Apply the Laplace transform to the initial value problem

$$y'' + 3y' + 2y = 4e^{-2t}, \qquad y(0) = 2, y'(0) = -7$$

to express $Y(s) = \mathscr{L}\{y(t)\}$ in the form $Y(s) = \frac{P(s)}{Q(s)}$; for example, (1) below is of this form. In particular, express $P(s)$ as a single polynomial, i.e. multiply out and combine like terms. Express $Q(s)$ factored into linear and/or irreducible quadratic terms.

Do not find the inverse Laplace transform.

4. $\boxed{6}$ Applying the Laplace transform to the initial value problem

$$y'' + 2y' + 10y = -20e^{-2t}, \qquad y(0) = 1, y'(0) = 7$$

gives the following

$$Y(s) = \frac{s^2 + 11s - 2}{(s+2)(s^2 + 2s + 10)}. \tag{1}$$

Determine $y(t) = \mathscr{L}^{-1}\{Y(s)\}$, the solution to the given initial value problem.