1. $\boxed{2}$ For what values of b is the mass-spring system given by

$$2x'' + bx' + 6x = 0$$

   underdamped? Sketch one such solution curve satisfying $x(0) = x'(0) = 1$.

2. Use the table to find the Laplace transform of the following.

   (a) $\boxed{1}$ $\qquad$ $f(t) = 4e^{-2t} + e^{2t}\sin 3t$

   (b) $\boxed{1}$ $\qquad$ $g(t) = \cos(3t)\sin(5t)$ $\qquad\qquad$ [HINT: Product to Sum identity.]

3. $\boxed{2}$ Use the table of Laplace transforms to show

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

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

$$y'' + 3y' + y = t\cos 2t, \qquad y(0) = 1, y'(0) = -3$$

to express $Y(s) = \mathcal{L}\{y(t)\}$ in the form $Y(s) = \frac{P(s)}{Q(s)}$; i.e. the right-hand side should be a single combined fraction with the numerator multiplied out and the denominator factored into linear and/or irreducible quadratic terms.

Do not find the inverse Laplace transform.