NAME: Solutions

1. (6 points). Find the most general solution to
   \[ y' - 3y = 5. \]

Separate Variables: \[ \frac{dy}{3y+5} = dt \]

Integrate: \[ u = 3y + 5 \]
\[ du = 3 \, dy \]
\[ \frac{1}{3} \int \frac{du}{u} = \frac{1}{3} \ln |3y+5| = t + C \]

Check: \[ y' - 3y = 3Ce^{3t} - 3Ce^{3t} + 5 = 5 \]

2. (4 points). Clearly identify the direction field of the ODE: \[ y' + 2y = 1. \]
Sketch the direction field. What is \( \lim_{t \to +\infty} y(t) \)?

ODE: \[ y' = 1 - 2y \]
Direction field: \( f(t, y) = 1 - 2y \) independent of \( t \)

Stationary curves:
- \( f(t, \frac{1}{2}) = 0 \)
- \( y \to \frac{1}{2}, f(t, y) < 0 \)
- \( \lim_{t \to +\infty} y(t) = \frac{1}{2} \) equilibrium soln.