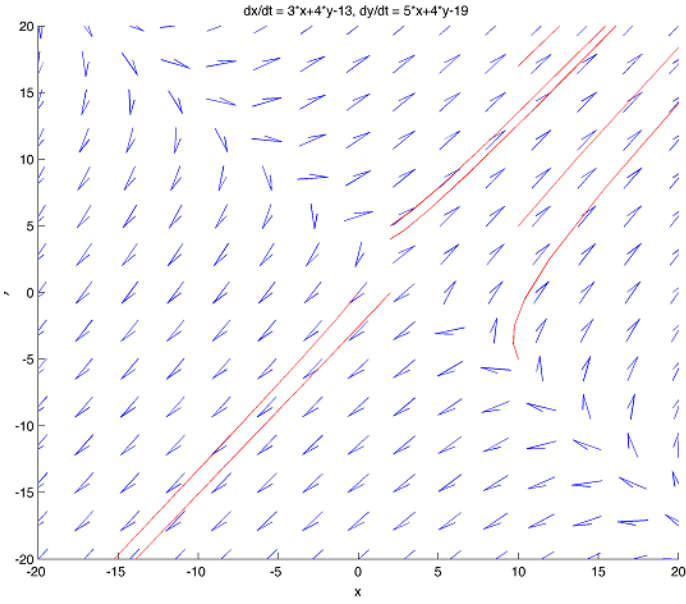
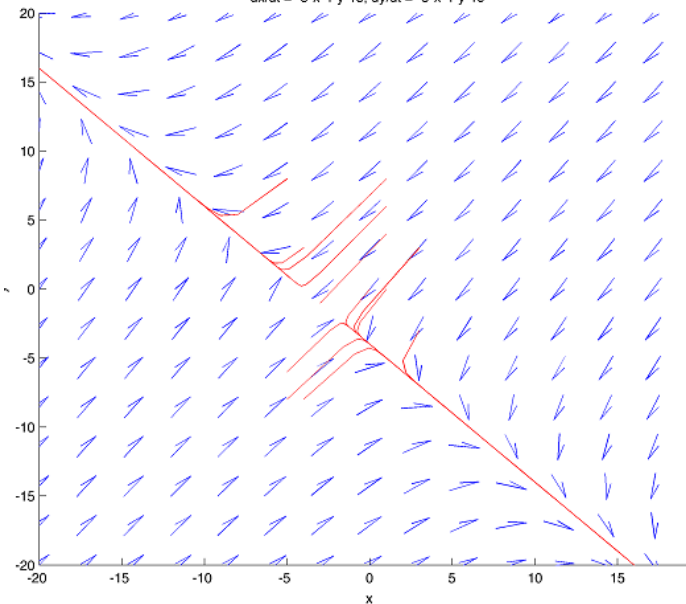
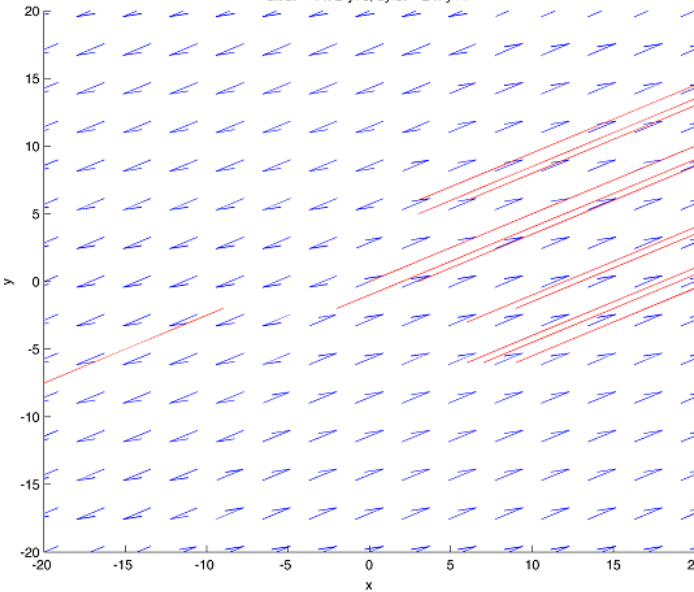
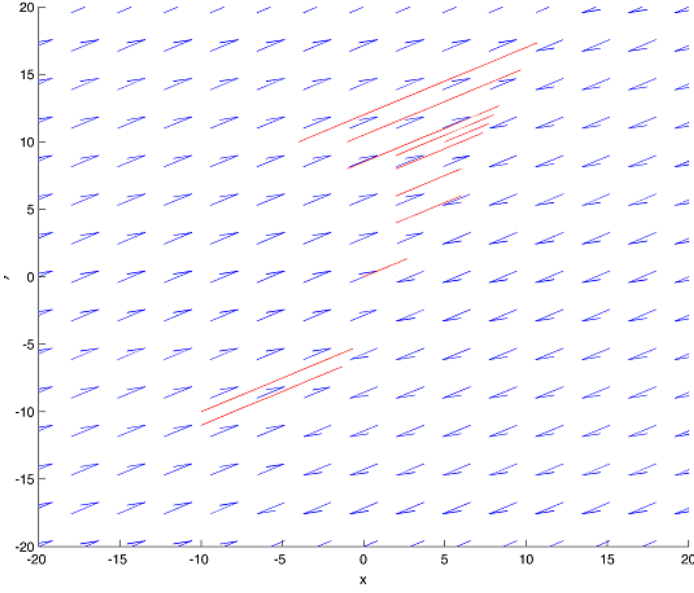
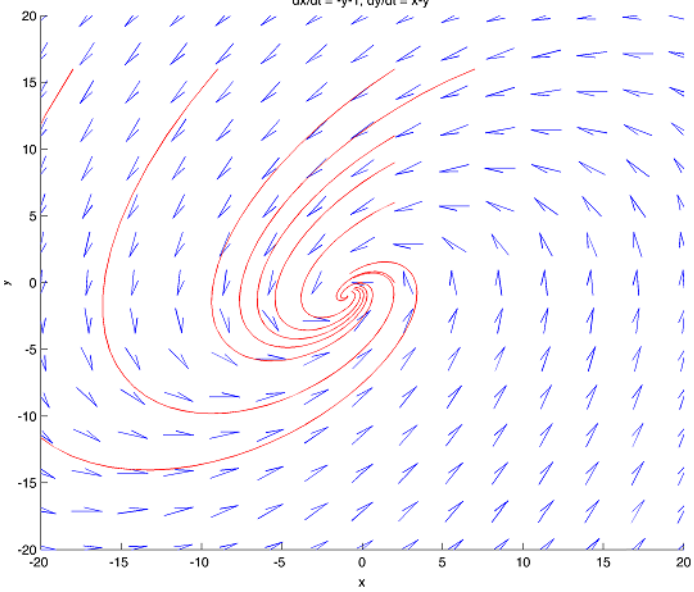
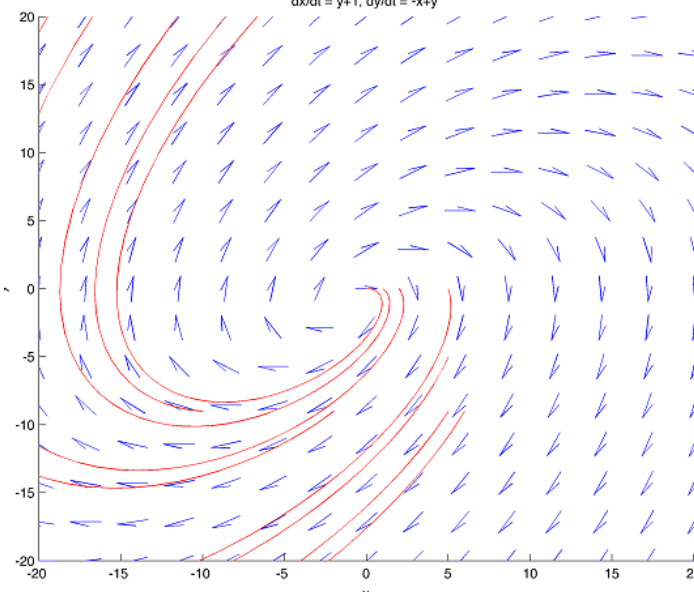
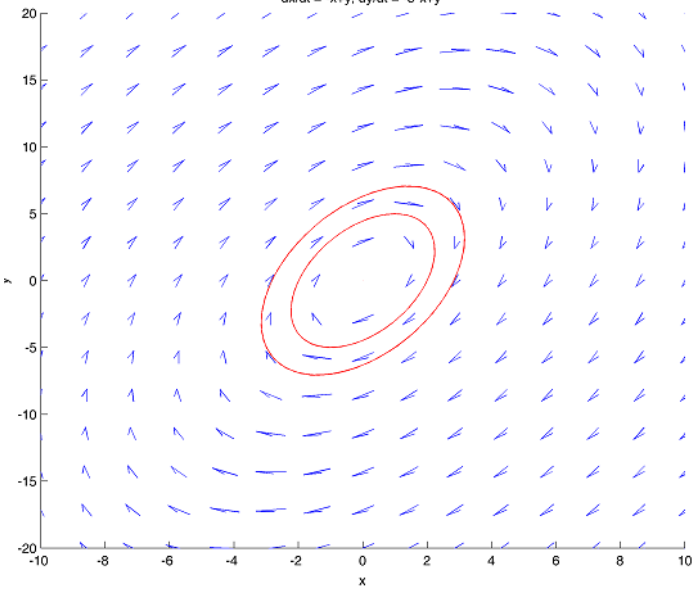
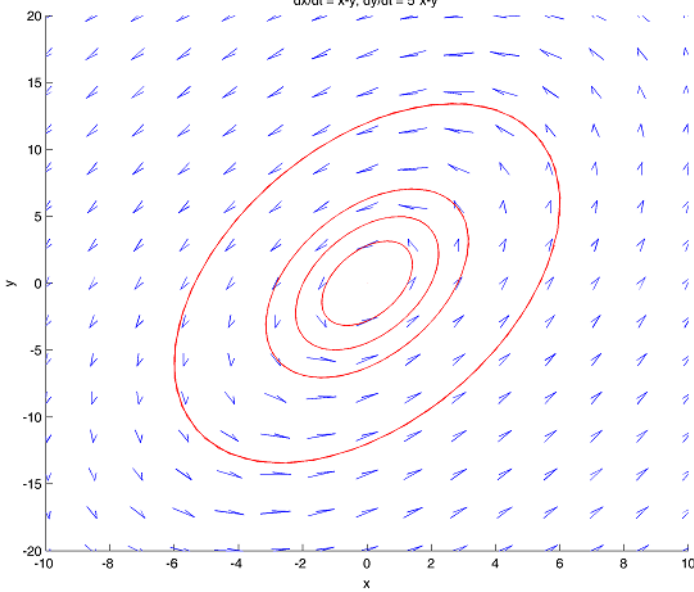


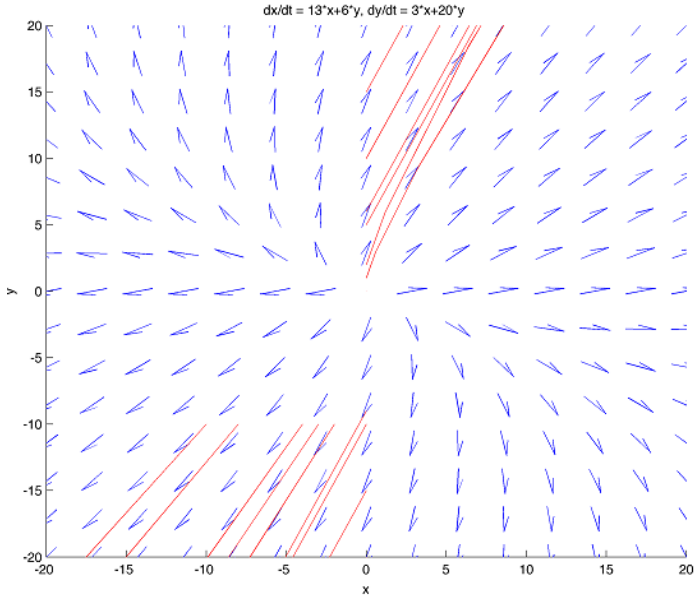
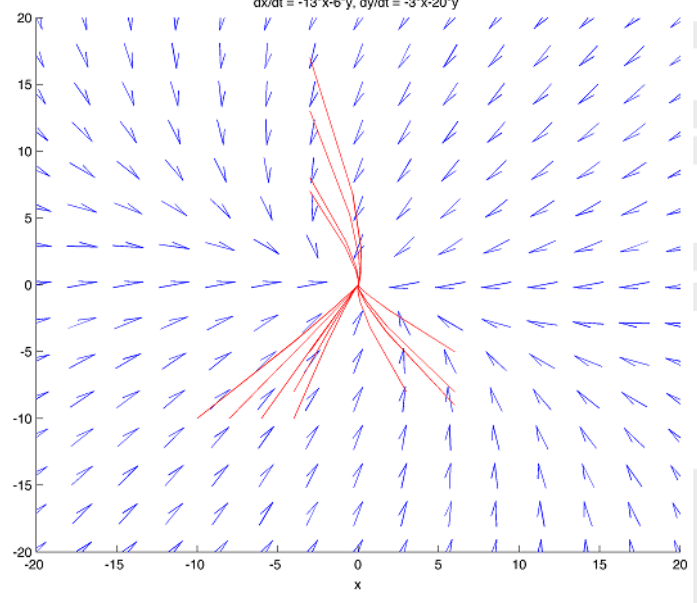
MAT 292 | MATLAB LAB 4 | ANALYZING PHASE PORTRAITS

4.1	a) $x_1 = 10$ $x_2 = -5$	c) Unstable Saddle point Outwards	d) Eigenvalues: $\lambda_1 = -1$ $\lambda_2 = 8$ <input checked="" type="checkbox"/> Real/opp. sign	<div> $dx/dt = 3x + 4y - 13$, $dy/dt = 5x + 4y - 19$ </div>  <div> Solution method: Euler Step size: 0.1 Plot color: Red Initial conditions $x_0 = 10$ $y_0 = -5$ Plot solution Solve equation </div>
4.2	a) $x_1 = 3$ $x_2 = -3$	c) Unstable Saddle point Outwards	d) Eigenvalues: $\lambda_1 = 1$ $\lambda_2 = -8$ <input checked="" type="checkbox"/> Real/opp. sign	<div> $dx/dt = -3x - 4y - 13$, $dy/dt = -5x - 4y - 19$ </div>  <div> Solution method: Euler Step size: 0.1 Plot color: Red Initial conditions $x_0 = 3$ $y_0 = -3$ Plot solution Solve equation </div>

4.3	<p>a)</p> $x_2 = -2x_1 - 2$	<p>c)</p> <p>Unstable Outwards</p>	<p>d)</p> <p>Eigenvalues: $\lambda_1 = 3$ $\lambda_2 = 0$ <input checked="" type="checkbox"/> Eq'l line, 1 const.</p>	<div> <div> $\frac{dx}{dt} = 4x - 2y + 8, \frac{dy}{dt} = 2x - y + 4$  </div> <div> <div>Solution method: Euler</div> <div>Step size: 0.1</div> <div>Plot color: Red</div> <div>Initial conditions</div> <div>x0 = -2</div> <div>y0 = -2</div> <div>Plot solution</div> <div>Solve equation</div> </div> </div>
4.4	<p>a)</p> $x_2 = -10x_1 - 11$	<p>c)</p> <p>Stable Towards</p>	<p>d)</p> <p>Eigenvalues: $\lambda_1 = -3$ $\lambda_2 = 0$ <input checked="" type="checkbox"/> Eq'l line, 1 const.</p>	<div> <div> $\frac{dx}{dt} = -4x + 2y + 8, \frac{dy}{dt} = -2x + y + 4$  </div> <div> <div>Solution method: Euler</div> <div>Step size: 0.1</div> <div>Plot color: Red</div> <div>Initial conditions</div> <div>x0 = -10</div> <div>y0 = -11</div> <div>Plot solution</div> <div>Solve equation</div> </div> </div>

4.5	<p>a)</p> $x_1 = -18$ $x_2 = 16$	<p>c)</p> Stable Spiral sink CCW	<p>d)</p> Eigenvalues: $\lambda_1 = -0.5 + (\sqrt{3}/2)i$ $\lambda_2 = -0.5 - (\sqrt{3}/2)i$ <input checked="" type="checkbox"/> Neg. real part; as $t \rightarrow \infty$, $\exp \rightarrow 0$	<div> $dx/dt = -y-1, dy/dt = x-y$  </div> <div> <div>Solution method: Euler</div> <div>Step size: 0.1</div> <div>Plot color: Red</div> <div>Initial conditions</div> <div>$x_0 = -18$</div> <div>$y_0 = 16$</div> <div>Plot solution</div> <div>Solve equation</div> </div>
4.6	<p>a)</p> $x_1 = -1$ $x_2 = -1$	<p>c)</p> Asymptotic. Unstable Spiral source CW	<p>d)</p> Eigenvalues: $\lambda_1 = 0.5 + (\sqrt{3}/2)i$ $\lambda_2 = 0.5 - (\sqrt{3}/2)i$ <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Pos. real part; as $t \rightarrow \infty$, $\exp \rightarrow \infty$	<div> $dx/dt = y+1, dy/dt = -x+y$  </div> <div> <div>Solution method: Euler</div> <div>Step size: 0.1</div> <div>Plot color: Red</div> <div>Initial conditions</div> <div>$x_0 = -20$</div> <div>$y_0 = -9$</div> <div>Plot solution</div> <div>Solve equation</div> </div>

4.7	a) $x_1 = -1$ $x_2 = 5$	c) Stable Centr e CW	d) Eigenval ues: $\lambda_1 = +2i$ $\lambda_2 = -2i$ <input checked="" type="checkbox"/> $\neq \infty$ AND $\neq 0$, so closed circles	<div> $dx/dt = -x+y, dy/dt = -5x+y$  </div> <div> <div>Solution method: Runge-Kutta</div> <div>Step size: 0.1</div> <div>Plot color: Red</div> <div>Initial conditions</div> <div>$x_0 = -1$</div> <div>$y_0 = 5$</div> <div>Plot solution</div> <div>Solve equation</div> </div>
4.8	a) $x_1 = 3$ $x_2 = 5$	c) Stable Centr e CCW	d) Eigenval ues: $\lambda_1 = +2i$ $\lambda_2 = -2i$ <input checked="" type="checkbox"/> $\neq \infty$ AND $\neq 0$, so closed circles	<div> $dx/dt = x-y, dy/dt = 5x-y$  </div> <div> <div>Solution method: Runge-Kutta</div> <div>Step size: 0.1</div> <div>Plot color: Red</div> <div>Initial conditions</div> <div>$x_0 = 3$</div> <div>$y_0 = 5$</div> <div>Plot solution</div> <div>Solve equation</div> </div>

4.9	<p>a)</p> $x_1 = -10$ $x_2 = -10$	<p>c)</p> Unstable Source Outwards	<p>d)</p> Eigenvalues: $\lambda_1 = 11$ $\lambda_2 = 22$ <input checked="" type="checkbox"/> Real/pos.	<div> $dx/dt = 13x + 6y, dy/dt = 3x + 20y$  </div> <div> <div>Solution method: Runge-Kutta</div> <div>Step size: 0.1</div> <div>Plot color: Red</div> <div>Initial conditions</div> <div>$x_0 = -10$</div> <div>$y_0 = -10$</div> <div>Plot solution</div> <div>Solve equation</div> </div>
4.10	<p>a)</p> $x_1 = -3$ $x_2 = 17$	<p>c)</p> Asymptotic . Stable Sink Inwards	<p>d)</p> Eigenvalues: $\lambda_1 = -11$ $\lambda_2 = -22$ <input checked="" type="checkbox"/> Real/neg.	<div> $dx/dt = -13x - 6y, dy/dt = -3x - 20y$  </div> <div> <div>Solution method: Runge-Kutta</div> <div>Step size: 0.1</div> <div>Plot color: Red</div> <div>Initial conditions</div> <div>$x_0 = -3$</div> <div>$y_0 = 17$</div> <div>Plot solution</div> <div>Solve equation</div> </div>