Homework 5

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Phys 684

November 5, 2024

Problem 1

Starting with the Maxwell wave equation

Problem 2

In the steady state, the OBE are

$$\left.\begin{aligned} 0 = &\quad -\gamma u(t) - \delta v(t) \\ 0 = &\quad \delta u(t) - \gamma v(t) - \Omega_0 w(t) \\ 0 = &\quad -\gamma_2(w(t)+1) + \tfrac{\Omega_0}{2} v(t) \end{aligned}\right\} \implies \begin{pmatrix} -\gamma & -\delta & 0 \\ \delta & -\gamma & -\Omega_0 \\ 0 & \Omega_0/2 & -\gamma \end{pmatrix} \begin{pmatrix} u \\ v \\ w \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ \gamma_2 \end{pmatrix}$$

Problem 3

(a)

Problem 4

(a)

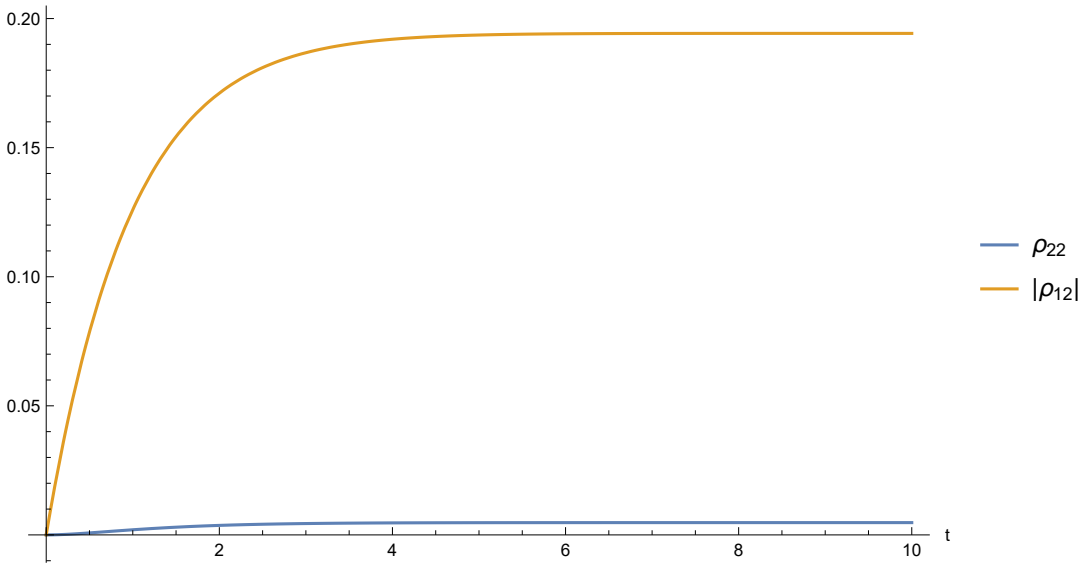
Problem 4 (Berman 4.3)

In[122]:=
```
SolveAndPlot[γ_, χ_, δ_] :=
 ({{uSoln, vSoln, wSoln}} = NDSolve[{u'[t] == -γ u[t] - δ v[t],
    v'[t] == δ u[t] - γ v[t] - (2 χ) w[t], w'[t] == -(2 γ) (w[t] + 1) + χ v[t],
    u[0] == 0, v[0] == 0, w[0] == -1}, {u, v, w}, {t, 0, 10}];
  Plot[{1/2 (w[x] + 1) /. wSoln, Sqrt[u[x]^2 + v[x]^2] /. uSoln /. vSoln}, {x, 0, 10},
   PlotRange → All, PlotLegends → {"ρ22", "|ρ12|"}, AxesLabel → {"t", ""}]);
```

$\gamma = 1;\ \Omega_0 = 0.2,\ \delta = 0.2$

In[123]:=
```
SolveAndPlot[1, 0.1, 0.2]
```

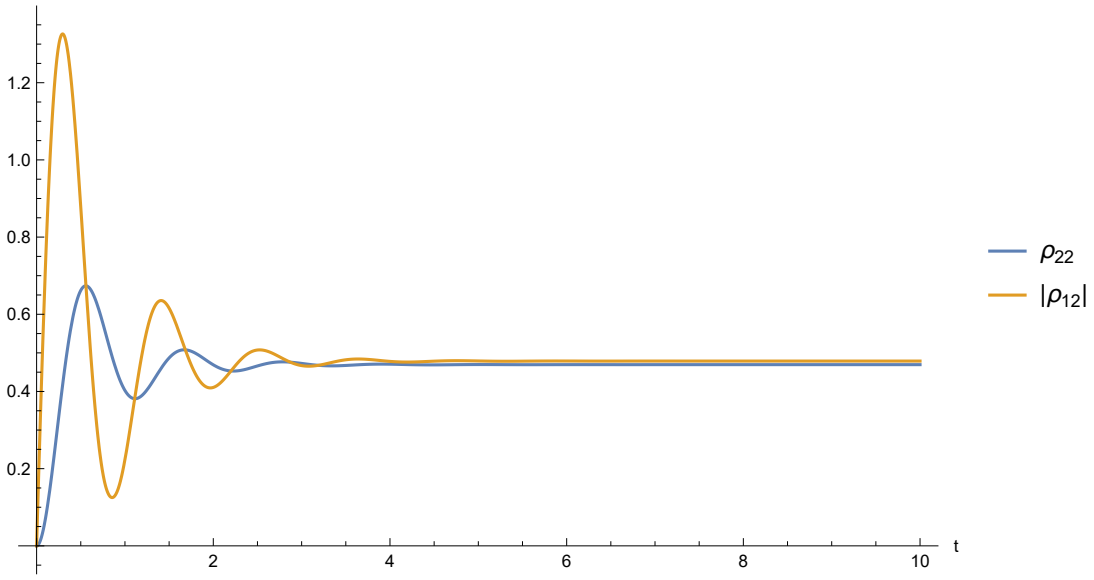
Out[123]=



$\gamma = 1;\ \Omega_0 = 8,\ \delta = 0.2$

In[124]:=
```
SolveAndPlot[1, 4, 0.2]
```

Out[124]=



$\gamma = 1;\ \Omega_0 = 8,\ \delta = 50$

In[125]:=
```
SolveAndPlot[1, 4, 50]
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Out[125]=