

PHY 5346  
Homework Set 12 Solutions – Kimel

2. 7.1 I shall apply Eqs.(26), (27), and (28)

$$\sqrt{\frac{s_0 + s_1}{2}} = a_1 \quad \sqrt{\frac{s_0 - s_1}{2}} = a_2 \quad \delta_l = \delta_2 - \delta_1 = \sin^{-1}\left(\frac{s_3}{2a_1a_2}\right)$$

$$\sqrt{\frac{s_0 + s_3}{2}} = a_+ \quad \sqrt{\frac{s_0 - s_3}{2}} = a_- \quad \delta_c = \delta_- - \delta_+ = \sin^{-1}\left(\frac{s_2}{2a_+a_-}\right)$$

a)  $s_0 = 3, s_1 = -1, s_2 = 2, s_3 = -2$

$$a_1 = 1, a_2 = \sqrt{2}$$

$$\delta_l = \sin^{-1}\left(\frac{-2}{2\sqrt{2}}\right) = -\frac{1}{4}\pi \text{ rad}$$

$$a_+ = \frac{1}{\sqrt{2}}, a_- = \sqrt{\frac{5}{2}}$$

$$\delta_c = \sin^{-1}\left(\frac{2}{2\left(\frac{1}{\sqrt{2}}\right)\left(\sqrt{\frac{5}{2}}\right)}\right) = 1.1071 \text{ rad}$$

b)  $s_0 = 25, s_1 = 0, s_2 = 24, s_3 = 7$

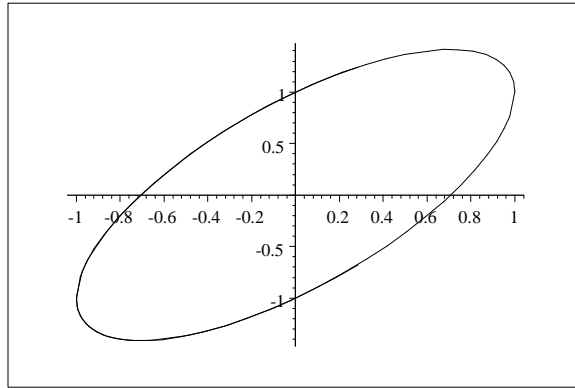
$$a_1 = \sqrt{\frac{25}{2}}, a_2 = \sqrt{\frac{25}{2}}$$

$$\delta_l = \sin^{-1}\left(\frac{s_3}{2a_1a_2}\right) = \sin^{-1}\left(\frac{7}{2\left(\sqrt{\frac{25}{2}}\sqrt{\frac{25}{2}}\right)}\right) = 0.28379 \text{ rad}$$

$$a_+ = \sqrt{\frac{32}{2}} = 4, a_- = \sqrt{\frac{s_0 - s_3}{2}} = 3$$

$$\delta_c = \delta_- - \delta_+ = \sin^{-1}\left(\frac{24}{2(4 \times 3)}\right) = \frac{1}{2}\pi \text{ rad}$$

To plot the two cases  $\text{Re}E_x \equiv X = \cos x$ ,  $\text{Re}E_y \equiv Y = r \cos(x - \delta_l)$ , where  $r = a_2/a_1$  and  $x = \omega t$ .  
Case a)  $\cos x$ ,  $\sqrt{2} \cos(x + \frac{\pi}{4})$



Case b)  $\cos x, \cos(x - 0.28379)$

