3.22. **Solve:** We have $\vec{E} = E_x\hat{i} + E_y\hat{j} = 2\hat{i} + 3\hat{j},$ which means $E_x = 2$ and $E_y = 3.$ Also, $\vec{F} = F_x\hat{i} + F_y\hat{j} = 2\hat{i} - 2\hat{j},$ which means $F_x = 2$ and $F_y = -2.$

(a) The magnitude of $\vec{E}$ is given by $E = \sqrt{E_x^2 + E_y^2} = \sqrt{(2)^2 + (3)^2} = 3.6$ and the magnitude of $\vec{F}$ is given by $F = \sqrt{F_x^2 + F_y^2} = \sqrt{(2)^2 + (2)^2} = 2.8.$

(b) Since $\vec{E} + \vec{F} = 4\hat{i} + 1\hat{j},$ the magnitude of $\vec{E} + \vec{F}$ is $\sqrt{(4)^2 + (1)^2} = 4.1.$

(c) Since $-\vec{E} - 2\vec{F} = -(2\hat{i} + 3\hat{j}) - 2(2\hat{i} - 2\hat{j}) = -6\hat{i} + 1\hat{j},$ the magnitude of $-\vec{E} - 2\vec{F}$ is $\sqrt{(-6)^2 + (1)^2} = 6.1.$