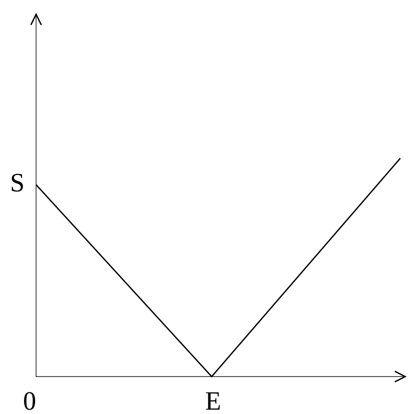
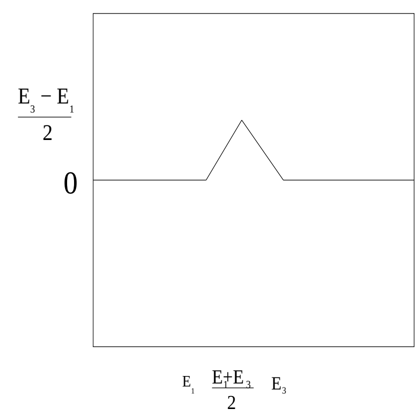
Outline Sloutions of Honours Class 11.949 Mathematics of Financial Derivatives Section 1

1. rise, fall, rise, fall.

2. if $S \geq E$, then $\max(S-E,0)+\max(E-S,0) = S-E$ & $|S-E| = S-E$. If $S \leq E$, then $\max(S-E,0)+\max(E-S,0) = E-S$ & $|S-E| = E-S$. So they are the same.





3. Value at expiry is

$$\max(S-E_1,0)+\max(S-E_3,0)-2\max(S-\frac{E_1+E_3}{2},0).$$

For $S \leq E_1$, payoff is $0+0=0$;
For $\frac{E_1+E_3}{2} \geq S \geq E_1$, payoff is $S-E_1+0+0 = S-E_1$;
For $E_3 \geq S \geq \frac{E_1+E_3}{2}$, payoff is $S-E_1+0-2\left[S-\frac{E_1+E_3}{2}\right] = -S+E_3$;
For $S \geq E_3$, payoff is $S-E_1+S-E_3-2\left[S-\frac{E_1+E_3}{2}\right] = 0$.

4. the holder of the bottom straddle on q2. would like the asset price on expiry to be as far away from E as possible (does not mind if above or below). The holder of the butter fly spread in q3. would like the asset price on expiry to be as close as possible to $\frac{E_1+E_3}{2}$.