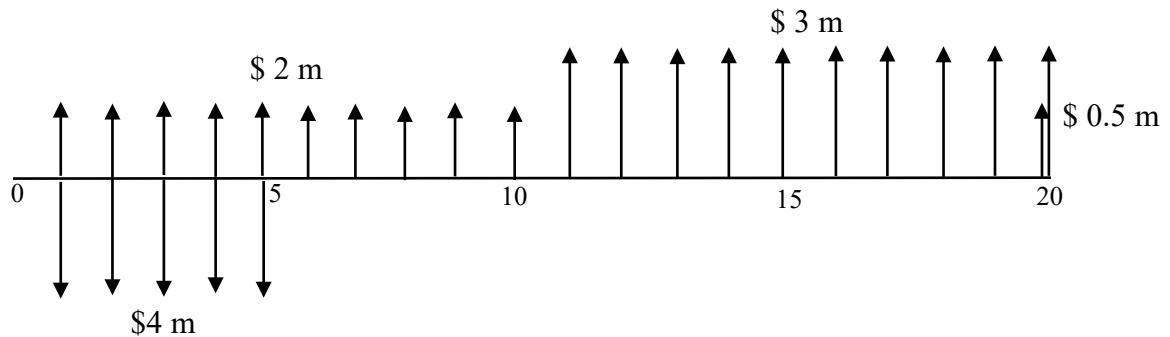


DSS5202 Sustainable Systems Analysis Solutions to Assignment #2

Q1.

Cash flow diagram:



Q2.

$$NPV(10\%) = \left[\sum_{k=1}^5 \frac{2-4}{(1+0.1)^k} + \sum_{k=6}^{10} \frac{2}{(1+0.1)^k} + \sum_{k=11}^{20} \frac{3}{(1+0.1)^k} + \frac{0.5}{(1+0.5)^{20}} \right] \times 10^6$$

$$= \$4,307,298.79 > 0$$

The project is **financially feasible**.

Q3.

The *IRR* of the project is r such that

$$\sum_{k=1}^5 \frac{-2}{(1+r)^k} + \sum_{k=6}^{10} \frac{2}{(1+r)^k} + \sum_{k=11}^{20} \frac{3}{(1+r)^k} + \frac{0.5}{(1+r)^{20}} = 0$$

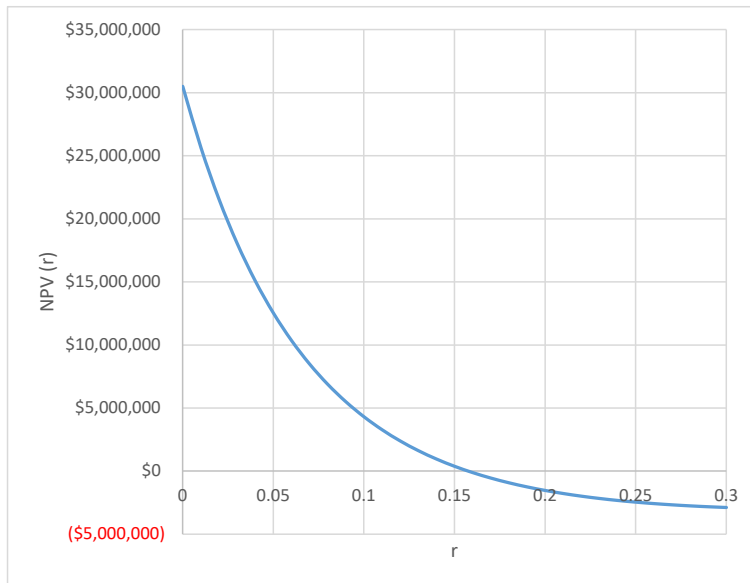
Using an equation solver: $r = 0.1575$

Hence $IRR = 15.75\% > 10\% = MARR$

The project is financially feasible.

Q4.

The two investment decisions will always be the same because $NPV(r)$ of the project cash flows is a decreasing function of r . See plot below.



Q5.

Financing rate = 8%

Reinvestment rate = 10%?

$$|PV(-ve \text{ CF at } 8\%)| = \sum_{k=1}^5 \frac{|-2|}{(1+0.08)^k} \times 10^6 = \$7,985,420.07$$

$$FV(+ve \text{ CF at } 10\%) = \left[2 \sum_{k=5}^{10} (1+0.1)^{20-k} + 3 \sum_{k=11}^{20} (1+0.1)^{20-k} + 0.5 \right] \times 10^6 = \$79,982,387.99$$

$$MIRR = \sqrt[20]{\frac{79,982,387.99}{7,985,420.07}} - 1 = 0.1221$$

$$= 12.21\% > 10\% = MARR$$

The project is financially feasible.