1.

(甲)

$MRS_{XY} = \frac{2XY}{X^2} = \frac{P_X}{P_Y} = \frac{10}{20} \Rightarrow X = 4Y$

(乙)

$Y = \frac{1}{4}X$ 代入，

$10X + 20\left(\frac{1}{4}X\right) = M$

$X = \frac{M}{15}$

(丙)

$MRS_{XY} = \frac{2Y}{X} = \frac{P_X}{20} \Rightarrow Y = \frac{P_X}{40}X$

$Y = \frac{P_X}{40}X$ 代入

$300 = P_X X + 20\left(\frac{P_X}{40}X\right) \Rightarrow X = \frac{200}{P_X}$

(丁)

由所得消費線、恩格爾曲線可知

X財貨為正常因，由需求線可知

X財貨符合需求法則