1.   Market 1:

$MR_1 = 100 - 2q_1$
$MR_1 = MC$
$100 - 2q_1 = 20$
$q_1 = 40$

$P_1 = 100 - q_1$
$P_1 = 100 - 40 = 60$
$P_1 = 60$

Market 2:

$MR_2 = 50 - q_2$
$MR_2 = MC$
$50 - q_2 = 20$
$q_2 = 30$

$P_2 = 50 - .5q_2$
$P_2 = 100 - .5(30) = 35$
$P_2 = 35$

If monopolist can't price discriminate:

$Q = q_1 + q_2$
$Q = (100 - P_1) + (100 - 2P_2)$
$Q = 200 - 3P$
$P = 200/3 - Q/3$
$MR = 200/3 - 2Q/3$
$MR = MC$
$200/3 - 2Q/3 = 20$
$-2Q/3 = -140/3$
$Q = 70$
$P = 200/3 - Q/3 = 200/3 - 70/3$
$P = 130/3 = 43.33$

2.

1st Degree Price discriminator sets P = MC so,
$\quad 50 - 7q = 1$
$\quad q = 7$
$\quad$ and

P = 1

Maximum price for admission is equal to consumer surplus so,

CS = .5(50 − 1)(7) = 171.5

Total profit for monopolist = CS = 171.5