# Problem set 1

**Q1.** YTM = FV / PV – 1 = 4.76%

**Q2.** 130 = 120/(1 + y)^2 + 20/(1+y), solving the equation YTM = 4.08%

A picture containing shoji, wall, indoor, white

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**Q3.**

A screenshot of a computer

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1. HPR = ((120/1.04^2 + 20/1.04 + 20) - 144.4) / 144.4 = 4.0%
2. HPR = ((120/1.05^2 + 20/1.05 + 20) - 144.4) / 144.4 = 2.42%
3. HPR = ((120/1.03^2 + 20/1.03 + 20) - 144.4) / 144.4 = 5.63%
4. This is because the equation to calculate the HPR is quadratic

**Q4.**

Because there is no arbitrage argument, so the interest rate is same as YTM = 8%

So 120/1.08^2 + 20/1.08 = PV = 121.4

**Q5.**

Because the bond is trading for $120, then there is a $1.4 arbitrage opportunity. For every bond I buy, I borrow 121.4 from the bank and only pay 120. Upon maturity, the total proceedings I have from the bond is 141.6, and the total repayment including principal I paid to the bank is also 141.6. I would like to borrow as much money as I can from the bank to buy this instrument.

**Q6.**

10% the YTM is same as coupon rate because the bond is sold at par

1. 8%

(1.08 \* 100 + 1100) = 1000\*(1+r)2, r= 9.91%

1. 10%, 10%
2. 12%

(1.12 \* 100 + 1100) = 1000\*(1+r)2, r= 10.09%

**Q7.**

1. The yield to maturity will be lower than the 3-year spot rate y3, on the basis that the other rates, such as the first, second, and third-year rates are lower than the 6% coupon rate.
2. Because bond price and YTM has inverse relationship, the bond will be traded at premium price.
3. Since the yield curve shifts down after purchase, the price of the bond decreases. The realised return will be higher than the 3-year spot rate.

**Q8**

Table

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We have 2 equations

105 = 10/(1+y1) + (110)/(1+y­2)2

123 = 20/(1+y1) + (120)/(1+y­2)2

Solving the equations, y1=7.53%, y2 = 7.2%