21-378 Mathematics of Fixed Income Markets Numerical Answers to 2016 Midterm Exam

- 1. (a) $\hat{r}(1) = .08208, f(1) = .07168$ (b) A = 107, 521.49
- 2. $y_{pc}(15) = .04973.$
- 3. (a) $D_{Mac}^{(1)} > D_{Mac}^{(2)} > D_{Mac}^{(3)}$ (b) $DV01^{(1)} > DV01^{(2)} > DV01^{(3)}$
- 4. (a) $D_{Mac}^{(A)} = 7.847, DV01^{(A)} = 2,343.98$ (b) The price will decrease by approximately \$56,255.52. (c) $F_3 = \frac{2,343.98}{.000679516} = 3,449,483$

5.

$$q = \frac{2[1+d(5)-d(10)-d(15)]}{\sum_{i=1}^{10} d(\frac{i}{2}) + 2\sum_{i=11}^{20} d(\frac{i}{2}) + \sum_{i=21}^{30} d(\frac{i}{2})}$$

- 6. $V_1 > 0$
- 7. Long 22,199,285 face of the 2-year bond and short 10,000,000 face of the 5 year bond