

Homework #4

Instructions: Answer the following questions on a **separate sheet of paper**.

1. Theo Walcott signed a 5 million pound contract with Arsenal in 2006 at the age of 16, making him the most expensive 16-year-old in English Premiership history. Suppose that at the time of signing, Walcott's bank offered a 15-year CD that compounds continuously with an APR of 6.1%.

(a) Find the APY of Walcott's CD.

$$100e^{.061} = 106.29$$

so the APY is 6.29%.

(b) If Theo took his initial signing bonus money, totaling 400,000 pounds, and deposited it into his CD, how much money will he have after the 15 years?

$$A = 400,000e^{(.061)(15)} = 998,710.10$$

so after 15 years, he will have 998,710.10 pounds.

(c) If Theo would like to have one and a half million pounds (1,500,000) in 15 years, how much should he deposit?

$$1,500,000 = Pe^{(.061)(15)}$$

$$1,500,000 = P(2.496775252)$$

$$\frac{1,500,000}{2.496775252} = P$$

$$600,774.94 = P$$

so Walcott should deposit at 600,774.94 pounds to have one and a half million pounds in 15 years.

2. After four years of playing for Manchester United, Cristiano Ronaldo (age 22) decided that it was time to start thinking about the future. He wants to open up a Portuguese restaurant in downtown New York City when he retires in 11 years, and decides to make a deposit into a savings account. One bank offers an account that compounds daily at an APR of 4.19%. Another bank offers an account that compounds quarterly at a APR of 4.21%.

(a) Which account is the better investment? (Hint: find the APY)

Acct #1	$100 \left(1 + \frac{.0419}{365}\right)^{365} = 104.279$	APY= 4.279%
Acct #2	$100 \left(1 + \frac{.0421}{4}\right)^4 = 104.277$	APY= 4.277%

So the first account is the better investment.

- (b) If it costs 3,000,000 dollars to open a restaurant, how much does Cristiano Ronaldo need to deposit to have the required amount after 11 years?

$$3,000,000 = P \left(1 + \frac{.0419}{365} \right)^{(365)(11)}$$

$$3,000,000 = P(1.58545835)$$

$$\frac{3,000,000}{1.58545835} = P$$

$$1,892,197.294 = P$$

so Cristiano should deposit \$1,892,197.29 into the first account.

3. Arjen Robben recently left Chelsea to play soccer in Spain. He made quite a bit of money while playing for Chelsea and decides to deposit some of it in an account, not to be withdrawn for 40 years. Suppose his bank offers a savings account that compounds quarterly at a rate of 5.21%.

- (a) Compute the APY of Robben's account.

$$100 \left(1 + \frac{.0521}{4} \right)^4 = 105.313$$

so the APY is 5.313%.

- (b) If Robben deposits 800,000 pounds, how much will he have after 40 years?

$$A = 800,000 \left(1 + \frac{.0521}{4} \right)^{(4)(40)} = 6,343,312.51 \text{ pounds}$$

- (c) If Robben would like to have 10 million pounds after the 40 years, how much should he deposit?

$$10,000,000 = P \left(1 + \frac{.0521}{4} \right)^{(4)(40)}$$

$$10,000,000 = P(7.929140638)$$

$$1,261,170.719 = P$$

so Robben should deposit 1,261,170.72 pounds in order to end up with 10 million pounds after 40 years.

4. Use scientific notation to compute the following expressions:

(a) $\frac{14,500,000,000}{.000000029} = \frac{1.45 \times 10^{10}}{2.9 \times 10^{-8}} = \frac{1.45}{2.9} \times 10^{10-(-8)} = .5 \times 10^{18} = 5 \times 10^{17}$

(b) $\frac{.0000000000008401}{.0000000271} = \frac{8.401 \times 10^{-13}}{2.71 \times 10^{-8}} = \frac{8.401}{2.71} \times 10^{-13-(-8)} = 3.1 \times 10^{-5}$

(c) $(123,000,000,000,000)(.0000000000000000456) = (1.23 \times 10^{14})(4.56 \times 10^{-18})$
 $= (1.23)(4.56) \times 10^{14+(-18)}$
 $= 5.6088 \times 10^{-4}$