Chapter 10 Practice

1. Given $y_{n+1} = .6y_n + 2$, $y_0 = 8$
   a) Find y_1, y_2, y_3.
   b) Graph the difference equation.
   c) Find y_{60} by solving the difference equation.

2. How much money can you borrow at 12% interest compounded monthly if the loan is to be paid off in monthly installments for 10 years and you can afford to pay $660 per month?

3. In order to buy a car, a person borrows $4000 from the bank at 6% interest compounded monthly. The loan is to be paid off in three years with equal monthly payments. What will the payments be? How much of the total amount that was paid went to interest?

4. Find the amount accumulated after 20 years if, at the end of each quarter, $300 is deposited into an account paying 8% interest compounded quarterly.

5. You have a child and you would like to send him/her to college in 18 years. Starting at the birth, you put a deposit into an annuity every month. The annuity earns 6.75% interest compounded monthly. How much money should you put in each month if you want to send your child to NC State [tuition, room, board, etc. estimated at $90,000 for 4 years]?

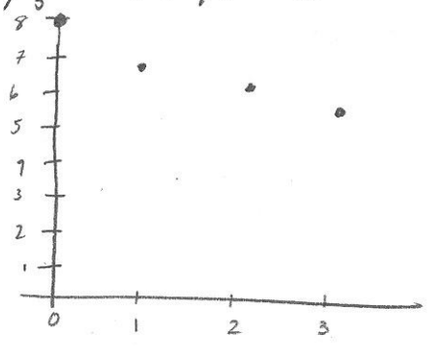
Chapter 10 Practice Solutions

1.a) $y_1 = .6y_0 + 2 = .6(8) + 2 = 6.8$

$y_2 = .6y_1 + 2 = .6(6.8) + 2 = 6.08$

$y_3 = .6y_2 + 2 = .6(6.08) + 2 = 5.648$

b)



c) $y_n = \frac{2}{1-.6} + \left(8 - \frac{2}{1-.6}\right)(.6)^n$

$y_n = 5 + 3(.6)^n$

$y_{60} = 5 + 3(.6)^{60} =$

$y_{60} = 5$ (technically 5.000000000000146)

2. $i = \frac{.12}{12} = .01$
$R = 660$
$y_{120} = 0$
} want y_0

$y_{n+1} = 1.01y_n - 660$

$y_n = \frac{-660}{1-1.01} + \left(y_0 - \frac{-660}{1-1.01}\right)(1.01)^n$

$y_n = 66000 + (y_0 - 66000)(1.01)^n$

$0 = y_{120} = 66000 + (y_0 - 66000)(1.01)^{120}$

$0 = y_{120} = 3.3y_0 - 151825.54$

$y_0 = \frac{151825.54}{3.3} = \$46,007.74$

3. $y_0 = 4000$
$i = \frac{.06}{12} = .005$
$y_{36} = 0$
} want R

$y_{n+1} = 1.005y_n - R$

$y_n = \frac{-R}{1-1.005} + \left(4000 - \frac{-R}{1-1.005}\right)(1.005)^n$

$y_n = 200R + (4000 - 200R)(1.005)^n$

$0 = y_{36} = 200R + (4000 - 200R)(1.005)^{36}$

$0 = 4786.722 - 39.3361$

$R = \frac{4786.722}{39.3361} \approx \$121.69$

$\approx 121.69 \times 36 = 4380.76 - 4000 = \$380.76$

4.) $D = \$300$
$i = \frac{.08}{4} = .02$
$Y_0 = 0$
$\Big\} Y_{80} = ?$

$$Y_{n+1} = 1.02 Y_n + 300 \quad Y_0 = 0$$

$$Y_n = \frac{300}{1-1.02} + \left(0 - \frac{300}{1-1.02}\right)(1.02)^n$$

$$Y_n = -15000 + 15000(1.02)^n$$

$$Y_{80} = -15000 + 15000(1.02)^{80}$$

$$Y_{80} = \$58{,}131.59$$

5) $i = \frac{.0675}{12} = .005625$
$Y_0 = 0$
$Y_{216} = 90{,}000$
$\Big\} D?$

$$Y_{n+1} = 1.005625 Y_n + D \quad Y_0 = 0$$

$$Y_n = \frac{D}{1-1.005625} + \left(0 - \frac{D}{1-1.005625}\right)(1.005625)^n$$

$$Y_n = -177.78D + 177.78D(1.005625)^n$$

$$90{,}000 = -177.78D + 177.78D(1.005625)^{216}$$

$$90{,}000 = 419.35D$$

$$D = \frac{90{,}000}{419.35} = \$214.62$$