

Problem 1. (5 points) Instead of investing \$1000 in his bank account (which pays 4% interest compounded quarterly,) Joey loaned the money to Bill. Bill agreed to pay the money back, plus interest, two years later. How much will Bill owe Joey when he pays him back?

$$i = \frac{.04}{4} = .01, n = 2 \times 4 = 8. \text{ So } F = 1.01^8 \times 1000 = \$1,082.86.$$

Problem 2. (7 points) IQ scores are normally distributed with a mean of 100 points and a standard deviation of 15 points. A **genius** is a person whose IQ score is 140 or more.

- a. What is the probability that a randomly selected person is a genius?

$$Pr(x \geq 140) = \text{normald}(140, 1000, 100, 15) = 0.0038.$$

- b. In a class of 300 students, about how many geniuses should there be ?

$300 \times 0.0038 = 1.14$, so we would expect about one genius in a class of this size. (This assumes the class represents a random sample from the entire population.)

Problem 3. (9 points) Consider the difference equation

$$y_n = -\frac{1}{4}y_{n-1} + 2, \quad y_0 = 4.$$

- a What value will the y_n approach for large n (i.e., what is the fixed point)?

$$\text{We have } a = -\frac{1}{4} \text{ and } b = 2. \text{ Thus, the fixed point is } \frac{b}{1-a} = \frac{2}{1-(-1/4)} = \frac{8}{5}.$$

- b Is the fixed point stable (attracting), unstable (repelling), or neither? How did you know?

$$\text{Stable, since } |a| = \frac{1}{4} < 1.$$

- c Describe the behavior of the y_n as monotone, oscillating, or neither. How did you know?

$$\text{Oscillating, since } a = -\frac{1}{4} < 0.$$

Problem 4. (9 points) Juanita saved for her son's education by putting \$100 every month into an account paying 6% interest compounded monthly.

- a. What will be the balance of this annuity after 15 years?

We have $i = .06/12 = 0.005$ and $n = 12 \times 15 = 180$. Thus $F = s_{180|0.005}R = (290.8187124) \times (100) = \$29,081.87$.

- b. How much interest is earned in total during the 15 years?

The interest is the accumulated value less the amount paid in. Thus it is $\$29,081.87 - 180 \times \$100 = \$11,081.87$.