Math-08 Homework #5 Solutions

Reading

- Text book section 1.1, review 0.2

Problems

1). At the beginning of January you open up a savings account with $1000 that pays 3% yearly interest compounded at the end of the month. You set up an autodeposit of $500 per month out of your paycheck that is deposited on the first of each month, starting in February. In January, February, March, and April you pay the following expenses:

Jan	$250
Feb	$750
Mar	$600
Apr	$200

What is your account balance on May 1, after the monthly deposit?

Note that there are 4 compounding periods. May does not count, because we ask for the balance immediately after the autodeposit on the first of the month; in other words, we don't wait until the end of month 5.

The resulting polynomial is as follows:

$$A(x) = 750x^4 - 250x^3 - 100x^2 + 300x + 500$$

Since the interest rate is 3% or 0.03 per year and the compounding period is 1 month, meaning 12 compounding periods per year, the interest rate per compounding period is give by:

$$\frac{r}{n} = \frac{0.03}{12} = 0.0025$$

which is 0.25%. Thus, the compounding factor is given by:

$$x = 1 + \frac{r}{n} = 1 + 0.0025 = 1.0025$$

Plugging this value into the polynomial results in the answer:

$$A(1.0025) = 1205.90$$

Remember, this is money, so round to the nearest cent!

So, your current balance on May 1 after the autodeposit is $1205.90.

2). Solve the following linear equation in a step-by-step fashion, justifying each step with one of the 10 axioms, substitution, and/or left/right cancellation:

$$3(x + 2) = 3$$

There are two possible ways to do this. The first way starts off with the distributive rule. The second way starts by multiplying both sides by $\frac{1}{3}$. Here is the first solution:

$3x + 6 = 3$	Left Distributive (LD)
$(3x + 6) - 6 = 3 - 6$	Well-defined Addition (WD)
$(3x + 6) - 6 = -3$	Substitution (SUB)
$3x + (6 - 6) = -3$	Additive Associativity (AA)
$3x + 0 = -3$	Additive Inverse (AI)
$3x = -3$	Additive Identity (A0)
$\frac{1}{3}(3x) = \frac{1}{3}(-3)$	Well-defined Multiplication (WD)
$\frac{1}{3}(3x) = -1$	Substitution (SUB)
$\left(\frac{1}{3} \cdot 3\right)x = -1$	Multiplicative Associativity (MA)
$1x = -1$	Multiplicative Inverse (M1)
$x = -1$	Multiplicative Identity (MI)

Here is the second solution:

$\frac{1}{3}[3(x + 2)] = \frac{1}{3} \cdot 3$	Well-defined Multiplication
$\frac{1}{3}[3(x + 2)] = 1$	Multiplicative Inverse (MI)
$\left(\frac{1}{3} \cdot 3\right)(x + 2) = 1$	Multiplicative Associativity (MA)
$1(x + 2) = 1$	Multiplicative Inverse (MI)
$x + 2 = 1$	Multiplicative Identity (M1)
$(x + 2) - 2 = 1 - 2$	Well-defined Addition (WD)
$(x + 2) - 2 = -1$	Substitution (SUB)
$x + (2 - 2) = -1$	Additive Associativity (AA)
$x + 0 = -1$	Additive Inverse (AI)
$x = -1$	Additive Identity (A0)