MATH 242
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Homework 1 – Algebra Review

Due: Wednesday, 18 January 1995

Purpose

- The study of differential equations is very difficult if the fundamental algebraic techniques and calculus concepts have not been mastered. This assignment, and a similar assignment you will receive on Wednesday, are intended to indicate a few of the basic skills that I expect you to have mastered.
- If you have forgotten how to work problems such as these, I suggest that you spend some time reviewing these techniques. (Note that even though I call this an algebra review, many of the methods needed to solve these problems can be found in your Calculus text.)
- If you have any questions about the assignment, please send them to me in an e-mail message.

Problems

1. Find all roots of the polynomials
   (a) $x^2 + 4x + 3$
   (b) $r^2 + 5r + 1$
   (c) $s^2 + s + 1$
2. Find all numbers c_1, c_2, and c_3 that satisfy the three equations $c_1 + c_2 - c_3 = 2$, $-c_1 + 2c_2 + c_3 = 1$, and $2c_1 + c_2 + c_3 = 0$.
3. Find the functions v_1 and v_2 that satisfy the two equations $v_1(x)\cos(x) + v_2(x)\sin(x) = 0$ and $-v_1(x)\sin(x) + v_2(x)\cos(x) = \tan(x)$.
4. Use trigonometric identities to write each of the following expressions in the form $A\sin(\omega t + \theta)$, i.e. solve for the constants A, ω, and θ. Express the angle θ in both degrees and in radians.
   (a) $\cos(3t) + \frac{4}{3}\sin(3t)$
   (b) $\frac{1}{\sqrt{2}}\cos(2\sqrt{3}t) - \frac{1}{3}\sin(2\sqrt{3}t)$
5. Convert each function into its equivalent partial fraction expansion
   (a) $f(x) = \dfrac{x^2 - 26x - 47}{(x-1)(x+2)(x+5)}$
   (b) $Y(s) = \dfrac{2s^2 + 3s + 3}{s(s+1)^2}$
   (c) $x(t) = \dfrac{2t}{(t+1)(t^2+4)}$