Exercises for "Maple Essentials, Lesson 1"

1. For the polynomial \( p(x) = 3x^4 + 5x^3 + 2x^2 - x + 2 \), use Maple to:

   (a) find \( p(2) \)

   (b) find the sequence of values \( p(k) \) for \( k=0, 1, 2, \ldots 20 \).

   (c) find \( p(a+1) \), expanded in powers of \( a \).

2. Now suppose \( p(x) = a x^4 + b x^3 + c x^2 + d x + e \).

   Using the Maple command "eval", find the value of \( p(x) \) at \( x = 1.4 \), if \( a = 2.1, b = 3.3, c = 1.1, d = 5.4 \), and \( e = 6.5 \).

   Do this in two ways:
   (a) all at once (i.e., \( x := 1.4, a := 2.1 \), etc.)
   (b) First evaluating the coefficients to get a polynomial \( p(x) \) with numerical coefficients, then evaluating this polynomial at \( x = 1.4 \).

3. Expand \( (3 + 4x)^{10} \) in powers of \( x \).

4. Obtain, in the form of a sequence, the expansions of \( (1 + x)^n \) in powers of \( x \) for integers \( n \) from 0 to 25.

5. (a) Use Maple to factor the polynomial \( p(x) = x^8 + x^7 - 7x^6 - 17x^5 - 6x^4 + 28x^3 + 28x^2 - 4x - 24 \).

   (b) Use the "expand" command to check your result.

   (c) The Maple command "expand" will write the polynomial with smallest powers of \( x \) first. Use the "sort" command on this result to rewrite this polynomial with highest powers of \( x \) first.

   (d) How might you use "evalb" to check your result without first rewriting the "expanded" polynomial in standard order?

6. Put the expression \( \frac{3x + 5}{(x + 2)^2 - 6} + \frac{6x + 5}{x + 4} + \frac{x^2 + 5x + 1}{3x + 2} \) over a common denominator. Then use the command "numerator" and "denominator" to pick off the numerator and denominator.

7. Express \( \sin(8t) - \sin(7t) + \sin(6t) - \sin(5t) \) as a sum of products of powers of \( \sin(t) \) and \( \cos(t) \).