Matlab Homework 10c

The same requirements as for homework 3c apply.

1. Repeat the last question of the previous homework, where you keep summing until the accuracy no longer improves, but this time use a `while` loop instead of a `for` loop.

2. Answer using symbolic math:

   (a) Given the equation for the area of a cylindrical container:

   $$A = 2\pi r^2 + 2\pi r\ell$$

   - Use the `solve` function to solve symbolically for the length ℓ in the equation in terms of A and r.
   - Test out the symbolic solution by verifying that if you take $A = \pi$ and $r = 2/3$, you get $1/12$ exactly. Be sure to use `sym('...')` wherever Matlab would provide a 16 digit number otherwise.
   - Convert the symbolic solution into a handle to a standard Matlab anonymous function.
   - Check that that function too returns $1/12$ for the example data, to almost 16 significant digits. Do so by using `fprintf` to print the result out to 32 digits behind the point.

   (b) Consider the cubic

   $$(x-3)(x-1)(x+2)$$

   - Let Matlab find the expanded cubic.
   - Let Matlab re-factor the expanded cubic. The output should look just like the one shown above.
   - Let Matlab find the exact roots of the expanded cubic.

   (c) Let Matlab symbolically integrate

   $$\int \ln(x)\,\mathrm{d}x$$

   and then differentiate the result again.

   (d) Let Matlab symbolically integrate

   $$\int_0^1 \ln(x)\,\mathrm{d}x \qquad \text{and} \qquad \int_{-3}^0 \frac{x}{x-b}\,\mathrm{d}x$$

   (The second solution is not quite right; the two logarithms should have been combined. Matlab, but not Octave, will also blather about the singular case that the pole $x = b$ is in the domain of integration.)

   (e) For the ratio

   $$\frac{s^3 - 5s^2 + 2s - 5}{s^4 - 4s^3 + 5s^2 - 4s + 4}$$

   let Matlab factor it and find its partial fraction expansion.