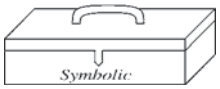
Practice Set A

Algebra and Arithmetic



Problems 3–8 require the Symbolic Math Toolbox. The others do not.

1. Compute:
   (a) $1111 - 345$.
   (b) e^{14} and 382801π to 15 digits each. Which is bigger?
   (c) the fractions 2709/1024, 10583/4000, and 2024/765. Which of these is the best approximation to $\sqrt{7}$?
2. Compute to 15 digits:
   (a) cosh(0.1).
   (b) ln(2). (*Hint*: The natural logarithm in MATLAB is called **`log`**, not **`ln`**.)
   (c) arctan(1/2). (*Hint*: The inverse tangent function in MATLAB is called **`atan`**, not **`arctan`**.)
3. Solve (symbolically) the system of linear equations

$$\begin{cases} 3x + 4y + 5z = 2 \\ 2x - 3y + 7z = -1 \\ \quad x - 6y + z = 3. \end{cases}$$

   Check your answer using matrix multiplication.
4. Try to solve the system of linear equations

$$\begin{cases} 3x - 9y + 8z = 2 \\ 2x - 3y + 7z = -1 \\ \quad x - 6y + z = 3. \end{cases}$$

   What happens? Can you see why? Again check your answer using matrix multiplication. Is the answer "correct"?
5. Factor the polynomial $x^4 - y^4$.

6. Use **simplify** or **simple** to simplify the following expressions:
   (a) $1/(1+1/(1+\frac{1}{x}))$
   (b) $\cos^2 x - \sin^2 x$
7. Compute 3^{301}, both as an approximate floating point number and as an exact integer (written in usual decimal notation).
8. Use either **solve** or **fzero**, as appropriate, to solve the following equations:
   (a) $8x + 3 = 0$ (exact solution)
   (b) $8x + 3 = 0$ (numerical solution to 15 places)
   (c) $x^3 + px + q = 0$ (Solve for x in terms of p and q)
   (d) $e^x = 8x - 4$ (*all* real solutions). It helps to draw a picture first.
9. Use **plot** and/or **ezplot**, as appropriate, to graph the following functions:
   (a) $y = x^3 - x$ for $-4 \le x \le 4$.
   (b) $y = \sin(1/x^2)$ for $-2 \le x \le 2$. Try this one with both **plot** and **ezplot**. Are both results "correct"? (If you use **plot**, be sure to plot enough points.)
   (c) $y = \tan(x/2)$ for $-\pi \le x \le \pi$, $-10 \le y \le 10$ (*Hint*: First draw the plot; then use **axis**.)
   (d) $y = e^{-x^2}$ and $y = x^4 - x^2$ for $-2 \le x \le 2$ (on the same set of axes).
10. Plot the functions x^4 and 2^x on the same graph and determine how many times their graphs intersect. (*Hint*: You will probably have to make several plots, using intervals of various sizes, to find all the intersection points.) Now find the approximate values of the points of intersection using **fzero**.