- Routine problems:
  Boyce & DiPrima:
  §6.5: 9, 12, 14;
  §6.6: 7, 10, 17, 21;
  Salas, Hille, & Etgen:
  §13.2: #40, 41;
  §13.3: # #33, 39, 40, 43, 45, #49.
  §13.4: # 29, 36, 37, 42, 46, 47, 48.
  §13.5: # 23, 24, 26, 29, 34, 40.
  §13.6: # 12, 13, 15, 27, 37, 41, 53.

- To hand in: 6.5 #12, 6.6 #21 and

  (1) Show that for any vectors $\mathbf{a}$ and $\mathbf{b}$,

  $$|\|\mathbf{a}\| - \|\mathbf{b}\|| \leq \|\mathbf{a} - \mathbf{b}\|$$

  (**Hint:** $\mathbf{a} = (\mathbf{a} - \mathbf{b}) + \mathbf{b}$.)

  (2)
  (a) Suppose that $\mathbf{a} \cdot \mathbf{b} = 0$ and $\mathbf{a} \times \mathbf{b} = \mathbf{0}$. Show that either $\mathbf{a} = \mathbf{0}$ or $\mathbf{b} = \mathbf{0}$.
  (b) Now suppose that $\mathbf{a} \neq \mathbf{0}$. Show that if $\mathbf{c}$ and $\mathbf{d}$ are vectors for which

  $$\mathbf{a} \cdot \mathbf{c} = \mathbf{a} \cdot \mathbf{d} \text{ and } \mathbf{a} \times \mathbf{c} = \mathbf{a} \times \mathbf{d}\,.$$

  Use the result of (a) to prove that $\mathbf{c} = \mathbf{d}$.

  (3) Let ℓ_1 and ℓ_2 be two skew (i.e. not parallel) line with parameterizations

  $$\ell_j : \quad \mathbf{r}(t) = \mathbf{r}_j + t\,\mathbf{d}_j, \quad j = 1, 2$$

  Show that the distance between the lines is given by the formula

  $$\mathrm{d}(\ell_1, \ell_2) = \frac{|(\mathbf{r}_2 - \mathbf{r}_1) \cdot (\mathbf{d}_1 \times \mathbf{d}_2)|}{\|\mathbf{d}_1 \times \mathbf{d}_2\|}$$