1. Factor $4x^2 - 25$.
   **Solution.** By the difference of squares formula, $4x^2 - 25 = (2x - 5)(2x + 5)$.

2. Factor $x^5 - 4x^3$.
   **Solution.** Factoring out the highest power of $x$ we have $x^5 - 4x^3 = x^3(x^2 - 4)$. By the difference of squares formula, $x^2 - 4 = (x - 2)(x + 2)$ so our final answer is $x^3(x - 2)(x + 2)$.

3. Use $2^{10} \approx 10^3$ to approximate $2^{80}$ as a power of ten.
   **Solution.** $2^{80} = (2^{10})^8 \approx (10^3)^8 = 10^{24}$.

4. Suppose $f(x) = x^2 - 5x + 13$. Simplify $\frac{f(x + h) - f(x)}{h}$.
   **Solution.**
   
   \[
   \frac{f(x + h) - f(x)}{h} = \frac{x^2 + 2xh + h^2 + 2x + 2h + 4 - (x^2 + 2x + 4)}{h} = \frac{2xh + h^2 + 2h}{h} = 2x + h + 2
   \]

5. For which of the following is $y$ a function of $x$? Write “Yes” or “No” following the statement. A brief explanation or equation is required to defend your work.
   (a) $\{(3, 1), (4, 2), (5, 2), (6, 7)\}$
   (b) $\{(3, 1), (4, 2), (4, 6), (6, 7)\}$
   (c) $y = 18x + 23 - \frac{2}{3}y$
   (d) $y^2 = 3x + 4$
   **Solutions.**
   (a) **YES.** $\{(3, 1), (4, 2), (5, 2), (6, 7)\}$ is a function; every one of the four inputs has a unique output.

   (b) **NO.** $\{(3, 1), (4, 2), (4, 6), (6, 7)\}$ IS NOT a function. The input 4 has two different outputs.

   (c) **YES.** $y = 18x + 23 - \frac{2}{3}y$ is a function; indeed we can solve for $y$ directly by adding $\frac{2}{3}y$ to both sides.

   (d) **NO.** $y^2 = 3x + 4$ IS NOT a function. If $x = 0$ then $y$ could be $-2$ or 2 and in general, many inputs for $x$ allow two different outputs.

6. Find the domain of the function $f(x) = \sqrt{x + 5}$. Put your answer in interval notation.
   **Solutions.** The domain of $f(x) = \sqrt{x + 5}$ is $[-5, \infty]$.
7. Find the domain of the function \( g(x) = \frac{\sqrt{x + 5}}{x} \). Put your answer in interval notation.

**Solutions.** The domain of \( g(x) = \frac{\sqrt{x + 5}}{x} \) is \([-5, 0) \cup (0, \infty)\).

8. Find the domain of the function \( h(x) = \frac{\sqrt{x + 5}}{x(x - 1)} \). Put your answer in interval notation.

**Solutions.** The domain of \( h(x) = \frac{\sqrt{x + 5}}{x(x - 1)} \) is \([-5, 0) \cup (0, 1) \cup (1, \infty)\).