Problem 1. Factor the polynomial $y^4 - 9y^3 + 14y^2$.

Solution:
We have
$$y^4 - 9y^3 + 14y^2 = y^2(y^2 - 9y + 14) = y^2(y - 7)(y - 2).$$

Problem 2. Find the midpoint and the distance of $(-3, 7)$ and $(2, 11)$.

Solution:
The midpoint is
$$m = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) = \left( \frac{-3 + 2}{2}, \frac{7 + 11}{2} \right) = \left( \frac{1}{2}, 9 \right).$$

The distance is
$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} = \sqrt{(-3 - 2)^2 + (7 - 11)^2} = \sqrt{(-5)^2 + (-4)^2} = \sqrt{25 + 16} = \sqrt{41}.$$

Problem 3. Given
$$g(x) = \begin{cases} \frac{1}{2}x - 1 & \text{if } x < 0 \\ 3 & \text{if } 0 \leq x \leq 1 \\ -2x & \text{if } x > 1 \end{cases}$$

what is $g(0), g(\frac{1}{2}), g(5)$?

Solution:
We have
$$g(0) = 3,$$
$$g \left( \frac{1}{2} \right) = 3,$$
$$g(5) = -2 \cdot 5 = -10.$$

Problem 4. Graph $y = |x| - 1$.

Solution:

Problem 5. Solve $\sqrt{5 - x} = 1$.

Solution:
We have
$$\sqrt{5 - x} = 1$$
$$(\sqrt{5 - x})^2 = 1^2$$
$$x - 5 = 1$$
$$x = 4$$

Hence $x = 4$. 
Problem 6. Solve \((x - 1)(x + 4) \leq 0\).

Solution:

Step 0: Already done. We want to find when is \(P(x) = (x - 1)(x + 4) = 0\) or \(P(x) > 0\).
Step 1: Solve \((x - 1)(x + 4) = 0\). We have \(x = 1, x = -4\).
Step 2: Create a sign chart.

Step 3: Answer the question.

\([-4, 1]\)

Problem 7. Calculate \(\log_2(\sqrt{2})\)

Solution:

By direct calculation

\[
\log_2(\sqrt{2}) = \log_2(2^{1/2}) \\
= \frac{1}{2} \log_2(2) \\
= \frac{1}{2}
\]