# Absolute-value graphs

6 questions | 20 marks

Equivalent correct methods earn the corresponding marks.

**1.** Write $f(x) = |x - 2| - 3$ piecewise and find its intercepts. [4 marks]

Split at $x = 2$.

Solve each valid linear branch for $y = 0$.

**Answer:** $f(x) = -x - 1$ for $x < 2$, and $x - 5$ for $x \geq 2$; roots $-1, 5$, y-intercept $-1$.

**2.** Find the turning points and zeros of $y = |x^2 - 4|$. [4 marks]

For $|x| < 2$, the rule is $4 - x^2$.

Outside that interval the rule is $x^2 - 4$.

**Answer:** Zeros $x = \pm 2$; corner minima $(\pm 2, 0)$; local maximum $(0, 4)$.

**3.** Solve $|2x - 1| = 5$. [3 marks]

$2x - 1 = 5$ or $2x - 1 = -5$.

Check both values in the original equation.

**Answer:** $x = 3$ or $x = -2$.

**4.** For $f(x) = x - 1$, compare $|f(x)|$ and $f(|x|)$. [3 marks]

The first reflects negative output upward.

The second mirrors the original right-hand graph into the left half-plane.

**Answer:** $|x - 1|$ has vertex $(1, 0)$; $|x| - 1$ has vertex $(0, -1)$.

**5.** Give the domain, range and symmetry of $y = |\frac{1}{x}|$. [3 marks]

It equals $\frac{1}{|x|}$.

It is positive and unchanged when $x$ is replaced by $-x$.

**Answer:** Domain $x \neq 0$; range $y > 0$; even symmetry.

**6.** Solve $|x + 2| < 3$ and explain the interval. [3 marks]

$-3 < x + 2 < 3$.

Subtract 2; the distance from $-2$ must be less than 3.

**Answer:** $-5 < x < 1$.