Inequalities

1. a) $x \leq -\frac{2}{5}$
   b) $x^2 \leq -3x + 2$
   c) $\left|7 + x^2\right| > x^2 + \frac{3}{2}x - \frac{5}{2}$
   d) $|x| > \frac{3}{2}$

2. a) $x \geq \frac{9}{2}$, solution set $[\frac{9}{2}, \infty)$
   b) $x > \frac{-5}{6}$ solution set $(\frac{-5}{6}, \infty)$
   c) The inequality is fulfilled for all real numbers. This can be seen, for example, by solving the corresponding equation with the pq-formula (there is no solution and the parabola is - since x^2 has a positive sign - open at the top, so it must run above the x-axis), or by quadratic addition to arrive at the equivalent inequality $(x-1)^2 + 2 > 0$.
   d) Transforming leads to the equivalent inequality $(x+2)^2 > 0$, thus all x except -2 belong to the solution set. This can also be written down as $\{x \in \mathbb{R} \colon x \neq -2\}$, $\mathbb{R} \setminus \{-2\}$ or in interval notation $(-\infty, -2) \cup (-2, \infty)$.
   e) An equivalent inequality is $\left(x + \frac{4}{3}\right)^2 + \frac{2}{9} \leq 0$, thus there is no solution (solution set is the empty set)
   f) An equivalent inequality is $x^2 + 2x + \frac{3}{4} \leq 0$, so we are looking for the negative area of a parabola open upwards. The parabola has zeros $-\frac{3}{2}$ and $\frac{-1}{2}$, so the inequality is satisfied for all x between the zeros (including the latter). Thus the solution set is $\left\{x \in \mathbb{R} \colon -\frac{3}{2} \leq x \leq \frac{-1}{2}\right\}$ or in interval notation $[-\frac{3}{2}, -\frac{1}{2}]$.
   g) Solution set is the interval $[-7, 3]$
   h) Solution set is $(-\infty, \frac{3}{5}] \cup [\frac{11}{5}, \infty)$
   i) Solution set is $(-\infty, -\frac{1}{2}] \cup [\frac{7}{6}, \infty)$
   j) Solution set is $(2, \frac{121}{20}]$