1. Solve the following equations:

   (a) $x^{4/3} - 3x^{4/3} - 4 = 0$
   Solution:
   Use substitution: $u = x^{2/3}$
   Then $u^2 - 3u - 4 = 0$
   Factor: $(u - 4)(u + 1) = 0$
   Hence $u = 4$ or $u = -1$
   Now find x: $x^{2/3} = 4$ or $x^{2/3} = -1$
   From the first equation: $x = \pm 4^{3/2} = \pm(\sqrt{4})^3 = \pm 8$
   The second equation does not have any real solutions, but it would have the complex solutions $\pm i$

   (b) $\sqrt{2x + 1} + 1 = x$
   Solution:
   First isolate the root: $\sqrt{2x + 1} = x - 1$
   Now square both sides: $2x + 1 = (x - 1)^2 = x^2 - 2x + 1$
   Now move everything to one side: $x^2 - 4x = 0$
   Factor: $x(x - 4) = 0$
   Hence $x = 0$ or $x = 4$
   Check solutions:
   0: $\sqrt{2 \cdot 0 + 1} + 1 = 1 + 1 = 2 \neq 0 \rightarrow$ no solution
   4: $\sqrt{2 \cdot 4 + 1} + 1 = 3 + 1 = 4 \rightarrow$ solution
   Hence the only solution is 4.

2. Solve the following inequalities:

   (a) $-2 < 8 - 2x < -1$
   Solution:
   Subtract 8: $-10 < -2x < -9$
   Divide by -2 (this will reverse the direction of the inequality): $5 > x > \frac{9}{2}$
   Hence the solution set is $(\frac{9}{2}, 5)$

(b) $\frac{3}{x-1} - \frac{4}{x} \geq 1$

Solution:

Move everything to one side: $\frac{3}{x-1} - \frac{4}{x} - 1 \geq 0$

Combine terms: $\frac{3x-4(x-1)-x(x-1)}{x(x-1)} \geq 0$

$\frac{3x-4x+4-x^2+x}{x(x-1)} \geq 0$

$\frac{-x^2+4}{x(x-1)} \geq 0$

$\frac{-(x+2)(x-2)}{x(x-1)} \geq 0$

Hence the critical numbers are -2, 0, 1, 2

Now put these values on the number line and test points inbetween:

-3: $\frac{-(-3+2)(-3-2)}{-3(-3-1)} < 0 \rightarrow$ not part of the solution

-1: $\frac{-(-1+2)(-1-2)}{-1(-1-1)} > 0 \rightarrow$ part of the solution

$\frac{1}{2}$: $\frac{-(\frac{1}{2}+2)(\frac{1}{2}-2)}{\frac{1}{2}(\frac{1}{2}-1)} < 0 \rightarrow$ not part of the solution

$\frac{3}{2}$: $\frac{-(\frac{3}{2}+2)(\frac{3}{2}-2)}{\frac{3}{2}(\frac{3}{2}-1)} > 0 \rightarrow$ part of the solution

3: $\frac{-(3+2)(3-2)}{3(3-1)} < 0 \rightarrow$ not part of the solution

Now check the endpoints:

0 and 1 are not part of the solution, since it is undefined

-2 and 2 are part of the solution, since it is $\geq$

Hence the solution set is $[-2, 0) \cup (1, 2]$

3. Solve $3|x + 5| + 6 = 15$ for x

Solution:

Isolate the absolute value:

$3|x + 5| = 9$

$|x + 5| = 3$

Thus $x + 5 = 3$ or $x + 5 = -3$

Hence $x = -2$ or $x = -8$

4. Solve $4|x+2|-3>13$
   Solution:
   Isolate the absolute value:
   $4|x+2|>16$
   $|x+2|>4$
   Now $x+2>4$ or $x+2<-4$
   Thus $x>2$ or $x<-6$
   Hence the solution set is $(-\infty,-6)\cup(2,\infty)$