Solving General Equations

FIRST: Remember the following important points!

1. Order of operations: BEDMAS

   First do Brackets, then Exponents, then Division and Multiplication (in the order they appear), then Addition and Subtraction (in the order they appear)

2. The inverse of ADDITION is SUBTRACTION (and vice versa)

   The inverse of MULTIPLICATION is DIVISION (and vice versa)

   The inverse of raising to a POWER is raising to the RECIPROCAL of that power

3. What you do do one side of the equation, you must do the EXACT SAME THING to the other side.

Method:

1. When given an equation, PRETEND you're actually asked to simply substitute a number into it, and figure out the resulting value. Write down EXACTLY the steps you used to arrive at the final answer.

2. Perform the INVERSE operations and in the REVERSE order to solve the equation!

eg: Solve for x in $y = \sqrt[3]{\frac{2x^5+1}{7}}$ or $y = \left(\frac{2x^5+1}{7}\right)^{1/3}$

① Pretend sub $x = -2$. $y = ?$

$$y = \left(\frac{2(-2)^5+1}{7}\right)^{1/3}$$

① Raise to 5th power $(-2)^5 = -32$

② Mult by 2 $2(-32) = -64$

③ Add 1 $-64+1 = -63$

④ Divide by 7 $-63/7 = -9$

⑤ Raise to 1/3 power : $(-9)^{1/3}$ (≈ -2.1)

Reverse & inverse

① Raise to 3rd power
② Mult. by 7
③ Subtract 1
④ Divide by 2
⑤ Raise to 1/5 power

$$y = \left(\frac{2x^5+1}{7}\right)^{1/3}$$

① $y^3 = \left[\left(\frac{2x^5+1}{7}\right)^{1/3}\right]^3 \Rightarrow y^3 = \frac{2x^5+1}{7}$

② $7y^3 = 7\left(\frac{2x^5+1}{7}\right) \Rightarrow 7y^3 = 2x^5+1$

③ $7y^3 - 1 = 2x^5 + 1 - 1 \Rightarrow 7y^3 - 1 = 2x^5$

④ $\frac{7y^3-1}{2} = \frac{2x^5}{2} \Rightarrow \frac{7y^3-1}{2} = x^5$

⑤ $\left(\frac{7y^3-1}{2}\right)^{1/5} = (x^5)^{1/5} \Rightarrow \left(\frac{7y^3-1}{2}\right)^{1/5} = x$

eg $y = \left(\frac{5\sqrt{x+1}^{(x+1)^{1/2}} - 3}{8}\right)^7$

If asked to plug in x = 8

① Add 1 ⇒ $8+1=9$
② Raise to 1/2: $9^{1/2} = 3$
③ Mult by 5: $5 \cdot 3 = 15$
④ Subt. 3: $15-3=12$
⑤ Div by 8: $12/8$
⑥ Raise to 7: $(12/8)^7$

Reverse and inverse

① Raise to 1/7
② Mult by 8
③ Add 3
④ Div by 5
⑤ Raise to 2
⑥ Subt. 1

$$y = \left(\frac{5(x+1)^{1/2} - 3}{8} \right)^7$$

① $y^{\frac{1}{7}} = \frac{5(x+1)^{1/2} - 3}{8}$

② $8y^{1/7} = 5(x+1)^{1/2} - 3$

③ $8y^{1/7} + 3 = 5(x+1)^{1/2}$

④ $\frac{8y^{1/7} + 3}{5} = (x+1)^{1/2}$

⑤ $\left(\frac{8y^{1/7} + 3}{5} \right)^2 = x + 1$

⑥ $\boxed{\left(\frac{8y^{1/7} + 3}{5} \right)^2 - 1 = x}$