2. $x-6>0$

Since the logarithmic function is one-to-one, $\log_{10}(x^2-9x+10)=\log_{10}(x-6)$ if and only $x^2-9x+10=x-6$.

Solving the last equation, we get two solutions: $x=8$ or $x=2$.

Now, we check whether these values satisfy inequalities 1 and 2 above.

Substituting $x=8$ in these inequalities, we get:

$8^2-9\cdot 8+10=2>0$

$8-6=2>0$

$x=8$ satisfies conditions 1 and 2, and hence it is a solution.

Substituting $x=2$ in inequality 1, we get $2^2-9\cdot 2+10=-4<0$

Since $x=2$ does not satisfy at least one of conditions 1 and 2, it is not a solution.

EXAMPLE 6.3c: Solve the equation $\log_3 x+\log_3(x+8)=2$.

SOLUTION: $\log_3 x+\log_3(x+8)=2$

Condition:

1. $x>0$
2. $x+8>0$

$\log_3 x(x+8)=2$ By Property 6

$x(x+8)=3^2$

$x^2+8x=9$

$x^2+8x-9=0$

$$x=\frac{-8\pm\sqrt{64+36}}{2}$$

$$x=\frac{-8\pm 10}{2}$$

$x=-9$, $x=1$

Since $x=-9$ violates condition 1, the only solution our equation has is $x=1$.