

Directions

In Problems 1-6, solve each of the given equations.

Hint: Each of these equations can be rewritten as a quadratic equation by using an appropriate substitution.

1. $(3x + 1)^2 + 7(3x + 1) - 8 = 0$

2. $\left(\frac{x}{4} - 3\right)^2 - \left(\frac{x}{4} - 3\right) - 20 = 0$

3. $3(1 - 4x)^2 + 10(1 - 4x) - 8 = 0$

4. $(\ln 2x - 1)^2 + 5(\ln 2x - 1) - 36 = 0$

5. $(|x - 1| - 2)^2 - 11(|x - 1| - 2) + 28 = 0$

6. $(e^{2x} - 1)^2 - 6(e^{2x} - 1) + 9 = 0$

Answers are on the back.

Solutions

1. Start by letting $w = 3x + 1$ to get the equation $w^2 + 7w - 8 = 0$. By factoring, we get the solutions $w = -8$ and $w = 1$. Then, back-solve for x to get $x = -3, x = 0$.
2. Start by letting $w = \frac{x}{4} - 3$; this gives $w^2 - w - 20 = 0$ so $w = 5, w = -4$. By back-solving for x , you get $x = -4, x = 32$.
3. Let $w = 1 - 4x$ to obtain $3w^2 + 10w - 8 = 0$; eventually $x = \frac{1}{12}, x = \frac{5}{4}$.
4. Let $w = \ln 2x - 1$; eventually $x = \frac{1}{2}e^5, x = \frac{1}{2}e^{-8}$.
5. Let $w = |x - 1| - 2$; eventually $x = -8, -5, 7, 10$.
6. Let $w = e^{2x} - 1$; eventually $x = \frac{1}{2} \ln 4$ (this could be rewritten as $x = \ln 2$).