Single Pure – Quadratic Formula, Completing Square & Discriminant

The first thing to work out is the discriminant, $b^2 - 4ac$. Students find it helpful to write it with a bracket: $b^2 - (4ac)$. This helps with the case $16 - (-8) = 24$. It is also worth remembering that

- If $b^2 - 4ac > 0$ then there exists two distinct roots.
- If $b^2 - 4ac = 0$ then there exists one repeated root.
- If $b^2 - 4ac < 0$ then there exists no real roots.
- If $b^2 - 4ac$ is a perfect square (e.g. 64) then the quadratic factorises.

Also remember that the first thing you do with any quadratic is get it equal to zero!

Questions

1. Use the formula to solve $2x^2 + x = 3$. $x = 1$ or $x = -3/2$
2. Check your answer to the above question by factorisation.
3. Use the formula to solve $3x^2 - 3x = 36$. $x = 4$ or $x = -3$
4. Check your answer to the above by completing the square and solving.
5. Use the formula to solve $x^2 + 8x + 5 = 0$. $x = -4 \pm \sqrt{11}$
6. Use the formula to solve $x^2 + 2x = 4$. $x = -1 \pm \sqrt{5}$
7. Use the formula to solve $x^2 - 5x = 19$. $x = \frac{5}{2} \pm \frac{\sqrt{101}}{2}$
8. Use the formula to solve $(x - 2)^2 = 5$. $x = 2 \pm \sqrt{5}$
9. Check the above answer by solution using completing the square; it's almost done for you!
10. Use the formula to solve $(2x + 1)^2 = \frac{3}{4}$. $x = -\frac{1}{2} \pm \frac{\sqrt{3}}{4}$
11. Check the above answer by solution using completing the square; it's almost done for you!
12. Use the formula to solve $2x^2 + 4x = 1$. $x = -1 \pm \frac{\sqrt{6}}{2}$
13. Check the above answer by solution using completing the square.
14. Use the formula to solve $3x^2 = 2x - 1$. No solutions
15. Use the formula to solve $\frac{1}{x+1} = x - 3$. $x = 1 \pm \sqrt{5}$
16. Use the formula to solve $\frac{3}{x+1} = 2x - 1$. $x = -\frac{1}{4} \pm \frac{\sqrt{33}}{4}$
17. Use the formula to solve $\frac{1}{x-3} + \frac{3}{2x+1} = 1$. $x = \frac{5}{2} \pm \frac{\sqrt{15}}{2}$
18. Solve $(x - 1)(2x + 3)(7x - 1) = 0$. $x = 1$ or $x = -3/2$ or $x = 1/7$
19. Solve $(2x + 1)(2x^2 + 3x - 2) = 0$. $x = \pm 1/2$ or $x = -2$
20. Solve $(4x^2 - 5x + 1)(x^2 - 6x - 7) = 0$. $x = \pm 1$ or $x = 1/4$ or $x = 7$
21. Find the value of k for which $2x^2 + 3x + k = 0$ has only one root. $k = 9/8$

22. Find the range of values of k for which $4x^2 + kx + 1 = 0$ has no roots. $\boxed{-4 < k < 4}$

23. The curve $y = 2x^2+3x+1$ has $y = 7x+k$ as a tangent. Using a method involving discriminants, find the value of k. $\boxed{k = -1}$