

E Michaelmas Harder Quadratic

Solve the following equations for x .

$$1. \frac{4}{x-2} - \frac{9}{x} = 1.$$

$$x = 3 \text{ or } x = -6$$

$$2. \frac{6}{x+1} - \frac{4}{x+2} = 1.$$

$$x = 2 \text{ or } x = -3$$

$$3. \frac{5}{x+6} + \frac{2}{x+3} = 2.$$

$$x = -1 \text{ or } x = -\frac{9}{2}$$

$$4. \frac{1}{x+2} - \frac{4}{x+3} = -1.$$

$$x = -1 \text{ (repeated)}$$

$$5. \frac{4}{x+1} + \frac{3}{x+2} = 3.$$

$$x = 1 \text{ or } x = -\frac{5}{3}$$

$$6. \frac{5}{x+1} - \frac{6}{x+2} = 2.$$

$$x = 0 \text{ or } x = -\frac{7}{2}$$

$$7. \frac{10}{x+1} = 3 - \frac{4}{x}.$$

$$x = 4 \text{ or } x = -\frac{1}{3}$$

$$8. \frac{5}{x} - \frac{4}{x+1} = 3.$$

$$x = 1 \text{ or } x = -\frac{5}{3}$$

$$9. \frac{4}{2x+1} - \frac{2}{2x+3} = \frac{3}{2}.$$

$$x = -\frac{11}{6} \text{ or } x = \frac{1}{2}$$

$$10. \frac{3}{2x+5} + \frac{2}{x+5} = 1.$$

$$x = 0 \text{ or } x = -4$$

$$11. x^2 = r^2.$$

$$x = r \text{ or } x = -r$$

$$12. 2x^2 + z^2 = 3xz.$$

$$x = z \text{ or } x = \frac{z}{2}$$

$$13. x^2 + 4rx = 5r^2.$$

$$x = r \text{ or } x = -5r$$

$$14. x^2 + ax = 2a^2.$$

$$x = a \text{ or } x = -2a$$

$$15. x(3x^2 + 14x - 5) = 0.$$

$$x = 0 \text{ or } x = -5 \text{ or } x = \frac{1}{3}$$

$$16. x^2 + 7r^2 = 8rx.$$

$$x = r \text{ or } x = 7r$$

$$17. x^2 = qx + 2q^2.$$

$$x = -q \text{ or } x = 2q$$

$$18. x^2 + e^3 = ex + e^2x.$$

$$x = e \text{ or } x = e^2$$

$$19. 2pq + 2px = x^2 + qx.$$

$$x = -q \text{ or } x = 2p$$

$$20. 2x^2 + 4xz = xy + 2yz.$$

$$x = -2z \text{ or } x = \frac{y}{2}$$

$$21. (x+2)(x^2 - 2x - 15) = 0.$$

$$x = -2 \text{ or } x = -3 \text{ or } x = 5$$

$$22. x^4 + 36 = 13x^2.$$

$$x = \pm 3 \text{ or } x = \pm 2$$

$$23. \frac{x+6}{x+2} + \frac{x^2+1}{x+3} = x+1.$$

$$x = 2 \text{ or } x = -\frac{7}{3}$$