6.4 Quadratic Formula

PRACTICE

Simplify the following if possible.

1. $\frac{4\pm\sqrt{18}}{6}$

$= \frac{4}{6} \pm \frac{\sqrt{9}\cdot\sqrt{2}}{6}$

$\frac{2}{3} \pm \frac{3\sqrt{2}}{6} = \frac{2}{3} \pm \frac{\sqrt{2}}{2}$

2. $\frac{5\pm\sqrt{40}}{2}$

$= \frac{5}{2} \pm \frac{\sqrt{4}\cdot\sqrt{10}}{2}$

$\frac{5}{2} \pm \frac{2\sqrt{10}}{2} = \frac{5}{2} \pm \sqrt{10}$

3. $\frac{6\pm\sqrt{25}}{3}$

$= \frac{6}{3} \pm \frac{5}{3}$

$= \frac{11}{3}$ or $\frac{1}{3}$

4. $\frac{4\pm\sqrt{-24}}{8}$

$= \frac{4}{8} \pm \frac{i\sqrt{24}}{8}$

$= \frac{1}{2} \pm \frac{i\sqrt{4}\sqrt{6}}{8} = \frac{1}{2} \pm \frac{2i\sqrt{6}}{8}$

$\frac{1}{2} \pm \frac{i\sqrt{6}}{4}$

5. $\frac{6\pm\sqrt{17}}{12}$

$= \frac{6}{12} \pm \frac{\sqrt{17}}{12}$

$\frac{1}{2} \pm \frac{\sqrt{17}}{12}$

6. $\frac{3\pm\sqrt{-11}}{2}$

$\frac{3}{2} \pm \frac{i\sqrt{11}}{2}$

Find the discriminant. How many solutions and what type?

7. $-5n^2 + 2n - 7 = 0$

$\sqrt{2^2 - 4(-5)(-7)}$

$\sqrt{4 - 140} = \sqrt{-136}$

2 imaginary

8. $9b^2 - 9b - 4 = 0$

$\sqrt{(-9)^2 - 4(9)(-4)}$

$\sqrt{81 + 144} = \sqrt{225}$

2 real

9. $4n^2 - 8n + 14 = 10$

$-10 \quad -10$

$\sqrt{(-8)^2 - 4(4)(4)}$

$\sqrt{64 - 64} = \sqrt{0}$

1 real

10. $10r^2 - 9r - 8 = -10$

$+10 \quad +10$

$10r^2 - 9r + 2$

$\sqrt{(-9)^2 - 4(10)(2)}$

$\sqrt{81 - 80} = \sqrt{1} = 1$

2 real

11. $-9a^2 - 4 = -5a$

$+5a \quad +5a$

$-9a^2 + 5a - 4 = 0$

$\sqrt{5^2 - 4(-9)(-4)}$

$\sqrt{25 - 144} = \sqrt{-119}$

2 imaginary

12. $8b^2 + 8b = -2$

$+2 \quad +2$

$8b^2 + 8b + 2$

$\sqrt{8^2 - 4(8)(2)}$

$\sqrt{64 - 64} = \sqrt{0}$

1 real

Solve using the quadratic formula.

13. $x^2 - 2x - 5 = 0$

$$\frac{2 \pm \sqrt{(-2)^2 - 4(1)(-5)}}{2(1)}$$

$$\frac{2 \pm \sqrt{4 + 20}}{2}$$

$$\frac{2 \pm \sqrt{24}}{2} = \frac{2}{2} \pm \frac{\sqrt{4}\sqrt{6}}{2}$$

$$= 1 \pm \frac{2\sqrt{6}}{2} = 1 \pm \sqrt{6}$$

14. $x^2 - 5x = -6.25$

$+6.25 \quad +6.25$

$$x^2 - 5x + 6.25 = 0$$

$$\frac{5 \pm \sqrt{(-5)^2 - 4(1)(6.25)}}{2(1)}$$

$$\frac{5 \pm \sqrt{25 - 25}}{2}$$

$$= \frac{5 \pm \sqrt{0}}{2} = \frac{5 \pm 0}{2}$$

$$= \frac{5}{2}$$

15. $9x^2 + 10x + 16 = 2x + 9$

$-2x \quad -9 \quad -2x \quad -9$

$$9x^2 + 8x + 7 = 0$$

$$\frac{-8 \pm \sqrt{8^2 - 4(9)(7)}}{2(9)}$$

$$\frac{-8 \pm \sqrt{64 - 252}}{18}$$

$$\frac{-8 \pm \sqrt{-188}}{18} = \frac{-8 \pm i\sqrt{188}}{18}$$

$$= \frac{-8 \pm i\sqrt{4}\sqrt{47}}{18}$$

$$= \frac{-8 \pm 2i\sqrt{47}}{18} = \frac{-8}{18} \pm \frac{2\sqrt{47}}{18}i$$

$$= -\frac{4}{9} \pm \frac{\sqrt{47}}{9}i$$

Solve using the quadratic formula. Check your solution by graphing. Label the vertex and the root(s).

16. $0 = -2x^2 + 12x - 14$

$$\frac{-12 \pm \sqrt{12^2 - 4(-2)(-14)}}{2(-2)}$$

$$\frac{-12 \pm \sqrt{144 - 112}}{-4} = \frac{-12 \pm \sqrt{32}}{-4}$$

$$= \frac{-12}{-4} \pm \frac{\sqrt{16}\cdot\sqrt{2}}{-4}$$

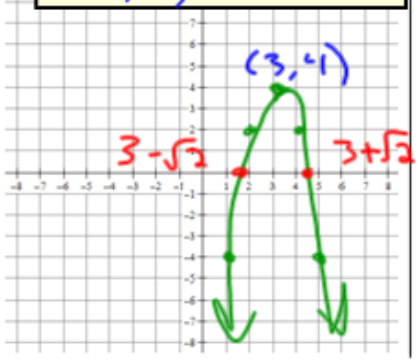
$$= 3 \pm \frac{4\sqrt{2}}{-4}$$

$$= 3 \pm \sqrt{2}$$

$1.59, 4.41$

vertex: $x = \frac{-12}{2(-2)} = 3$

(3, 4)



17. $-\frac{1}{2}x^2 + 2x - 5 = 0$

$$\frac{-2 \pm \sqrt{2^2 - 4(-\frac{1}{2})(-5)}}{2(-\frac{1}{2})}$$

$$\frac{-2 \pm \sqrt{4 - 10}}{-1} = \frac{-2 \pm \sqrt{-6}}{-1}$$

$$= \frac{-2}{-1} \pm \frac{i\sqrt{6}}{-1}$$

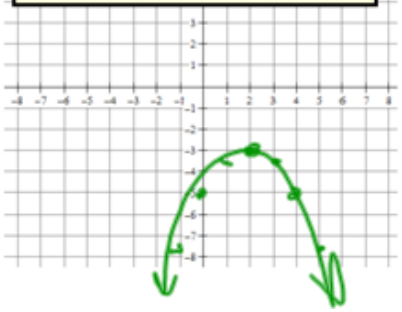
$$= 2 \pm i\sqrt{6}$$

$2 \pm 2.449i$

imaginary roots

Vertex: $x = \frac{-2}{2(-\frac{1}{2})}$

(2, -3)



Describe and the correct the error!

18. Solve. $0 = 3x^2 - 12x + 24$

$$\frac{12 \pm \sqrt{(-12)^2 - 4(3)(24)}}{2(3)} = \frac{12 \pm \sqrt{-144 - 288}}{6} = \frac{12 \pm \sqrt{-432}}{6} = \frac{12 \pm i\sqrt{432}}{6} = \frac{12 \pm 12i\sqrt{3}}{6} = 2 \pm 2i\sqrt{3}$$

$(-12)^2 = 144$

$$\frac{12 \pm \sqrt{144 - 288}}{6} = \frac{12 \pm \sqrt{-144}}{6} =$$

X

$$= \frac{12 \pm 12i}{6} = \frac{12}{6} \pm \frac{12}{6}i = 2 \pm 2i$$