PRACTICE

Find the discriminant. State the number and nature of the solutions for each quadratic below.

1. $-5n^2 + 2n - 7 = 0$

$2^2 - 4(-5)(-7)$

$\boxed{-136}$

No real solutions
2 imaginary solutions

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

$(-9)^2 - 4(9)(-4)$

$\boxed{225}$

2 real solutions

3. $4n^2 - 8n + 14 = 10$

$-10 \quad -10$

$4n^2 - 8n + 4 = 0$

$(-8)^2 - 4(4)(4)$

$\boxed{0}$

1 real solution

4. $10r^2 - 9r - 8 = -10$

$+10 \quad +10$

$10r^2 - 9r + 2 = 0$

$(-9)^2 - 4(10)(2)$

$\boxed{1}$

2 real solutions

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

$+5a \quad +5a$

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

$5^2 - 4(-9)(-4)$

$\boxed{-119}$

No real solutions
2 imaginary solutions

6. $8b^2 + 8b = -2$

$+2 \quad +2$

$8b^2 + 8b + 2 = 0$

$8^2 - 4(8)(2)$

$\boxed{0}$

1 real solution

Solve using the quadratic formula. Express radical solutions in the simplest form.

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

$a = 1$
$b = -2$
$c = -5$

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

$$\frac{2 \pm \sqrt{24}}{2}$$

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

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

$$\boxed{1 \pm \sqrt{6}}$$

8. $2x^2 - 5x = -6$

$+6 \quad +6$

$2x^2 - 5x + 6 = 0$

$a = 2$
$b = -5$
$c = 6$

$$\frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(6)}}{2(2)}$$

$$\frac{5 \pm \sqrt{-23}}{4}$$

$$\frac{5 \pm i\sqrt{23}}{4}$$

$$\boxed{\frac{5}{4} \pm \frac{i\sqrt{23}}{4}}$$

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

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

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

$a = 9$
$b = 8$
$c = 7$

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

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

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

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

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

10. $3x^2 - 11x - 4 = 0$

$a = 3$
$b = -11$
$c = -4$

$$\frac{-(-11) \pm \sqrt{(-11)^2 - 4(3)(-4)}}{2(3)}$$

$$\frac{11 \pm \sqrt{169}}{6}$$

$$\frac{11 \pm 13}{6}$$

$$\frac{11+13}{6} \text{ or } \frac{11-13}{6}$$

$$\frac{24}{6} \text{ or } \frac{-2}{6}$$

$$\boxed{4 \text{ or } -\tfrac{1}{3}}$$

11. $4x^2 + 20x = -25$

$+25 \quad +25$

$4x^2 + 20x + 25 = 0$

$a = 4$
$b = 20$
$c = 25$

$$\frac{-20 \pm \sqrt{(20)^2 - 4(4)(25)}}{2(4)}$$

$$\frac{-20 \pm 0}{8}$$

$$\frac{-20}{8}$$

$$-\frac{5}{2}$$

12. $x^2 - 5x + 30 = 7x - 10$

$-7x + 10 \quad -7x + 10$

$x^2 - 12x + 40 = 0$

$a = 1$
$b = -12$
$c = 40$

$$\frac{-(-12) \pm \sqrt{(-12)^2 - 4(1)(40)}}{2(1)}$$

$$\frac{12 \pm \sqrt{-16}}{2}$$

$$\frac{12 \pm 4i}{2}$$

$$\frac{12}{2} \pm \frac{4i}{2}$$

$$6 \pm 2i$$

Try using the discriminant to answer the following multiple choice questions.

13. Which of the following quadratic functions, when graphed, would not cross the x-axis?

Discriminant

(A) $y = 2x^2 + 5x - 3$ 49
(B) $y = 4x^2 - 4x + 5$ -64
(C) $y = -x^2 - x + 6$ 25
(D) $y = 3x^2 - 13x + 4$ 121

B

Does not cross x-axis means no real solutions, so when is the discriminant negative?

14. Which of the following quadratic functions has imaginary roots?

Discriminant

(A) $x^2 + 3x - 5 = 0$ 29
(B) $2x^2 - 3x + 1 = 0$ 1
(C) $x^2 + 6x + 10 = 0$ -4
(D) $x^2 - 7x + 10 = 0$ 9

C

Imaginary roots means no real solutions, so when is the discriminant negative?

15. Which of the following quadratic functions, when graphed, would touch the x-axis exactly once?

Discriminant

(A) $y = x^2 - 2x - 3$ 16

D (B) $y = x^2 + 5x - 2$ 33

(C) $y = 2x^2 + 3x + 7$ -47

(D) $y = x^2 - 12x + 36$ 0

Touch x-axis exactly once means one solution, so when is the discriminant zero?

16. Which of the following quadratic functions, when graphed, would lie entirely above the x-axis?

Discriminant

(A) $y = 2x^2 + x - 21$ 169

B (B) $y = x^2 - 4x + 7$ -12

(C) $y = x^2 - x - 6$ 25

(D) $y = x^2 - 10x + 16$ 36

Entirely above the x-axis means it does not cross the x-axis which means no real solutions, so when is the discriminant negative?

Perform the indicated operation.

Polynomials

18. $\frac{2x^3+x^2-7x+4}{x-1}$

$$\begin{array}{r|rrrr} 1 & 2 & 1 & -7 & 4 \\ & & 2 & 3 & -4 \\ \hline & 2 & 3 & -4 & \boxed{0} \end{array}$$

remainder

$2x^2 + 3x - 4$

Rational Expressions

19. $\frac{3}{x+1} \div \frac{4x}{x^2-1}$

$\frac{3}{x+1} \cdot \frac{x^2-1}{4x}$

$\frac{3}{\cancel{x+1}} \cdot \frac{\cancel{(x+1)}(x-1)}{4x}$

$\frac{3(x-1)}{4x}$

Radicals

20. $\frac{3+\sqrt{2}}{5-\sqrt{3}}$ $(5+\sqrt{3})$ $(5+\sqrt{3})$

$\frac{15+3\sqrt{3}+5\sqrt{2}+\sqrt{6}}{25+\cancel{5\sqrt{3}}-\cancel{5\sqrt{3}}-\sqrt{9}}$

$\boxed{\frac{15+3\sqrt{3}+5\sqrt{2}+\sqrt{6}}{22}}$