

Polynomials and Rational Expressions Review

Answer key Final answers only. Try first, then check.

CORE SKILLS

K1

a) $2x^2 - x + 8$
 b) $-2x^2 + 13x$
 c) $3x^2 - 12x + 13$

K2

a) $-4x(x-1)(x-2)$
 b) $(2x+3)(3x-4)$
 c) $(x-3)(x-2)(x+2)$

K3

a) $\frac{x-3}{x-2}, x \neq -3, 2$
 b) $-\frac{2}{x+5}, x \neq \pm 5$
 c) $\frac{x+3}{2x+1}, x \neq \pm \frac{1}{2}$

K4

a) $\frac{2x(x-2)}{x-1}, x \neq -2, 0, 1$
 b) $\frac{x+1}{x-3}, x \neq \pm 1, \pm 3$
 c) $\frac{2(x+1)}{x}, x \neq 0, \pm 4$

K5

a) $\frac{2(x+3)}{x-2}, x \neq 2$
 b) $\frac{7x+8}{x(x+2)}, x \neq -2, 0$
 c) $\frac{1}{x+3}, x \neq -3, 2$

REAL WORLD

A1

a) $V(x) = x(30-2x)(20-2x) = 4x^3 - 100x^2 + 600x; V(5) = 1000 \text{ cm}^3$
 b) $V(x) = 4x(x-10)(x-15); x = 0, 10, 15$
 c) None: $x = 0$ cuts nothing and $x = 10$ uses up the whole 20 cm side, so both leave no box; $x = 15$ is impossible, since two 15 cm cuts need 30 cm of a 20 cm side. Domain: $0 < x < 10$.

A2

a) $T(s) = \frac{6}{s-2} + \frac{6}{s+2} = \frac{12s}{s^2-4}$
 b) $T(4) = 4 \text{ h}$; upstream 3 h, downstream 1 h, so 2 h longer
 c) Nothing real: at 1 km/h the canoeist is slower than the current and drifts backwards, so they never reach the turning point and no trip time exists. Domain: $s > 2$.

A3

a) $P(\text{green, green}) = \frac{x(x-1)}{(x+2)(x+1)}; P(\text{green, orange}) = \frac{2x}{(x+2)(x+1)}$
 b) $\frac{x-1}{2}$; 4 times as likely
 c) Nothing: with no green tokens, $P(\text{green, orange}) = 0$, so the quotient divides by zero and is undefined. $x = 0$ is a restriction that cancelling hid; a ratio of probabilities can never be negative.

THINK IT THROUGH

T1

a) The minus sign must apply to all of $x + 15$: $x(x + 3) - (x + 15) = x^2 + 2x - 15$. Result: $\frac{x + 5}{x + 3}$, $x \neq \pm 3$.

b) $x = 3$ and $x = -3$ are restrictions: any expression with $(x - 3)(x + 3)$ in its denominator is undefined there, so matching "undefined" says nothing. A test needs allowed values.

c) e.g. $x = 0$: original = $\frac{5}{3}$, student's answer = $-\frac{5}{3}$, corrected answer = $\frac{5}{3}$

T2

a) $f(x) = \frac{x(x - 4)}{x(x - 2)}$

b) $\frac{2(x - 5)}{(x + 5)(x - 5)} = \frac{2x - 10}{x^2 - 25}$

c) e.g. $\frac{x(x + 1)}{x(x - 3)}$: $x \neq 0, 3$; $\frac{(x + 1)(x + 2)}{(x - 3)(x + 2)}$: $x \neq -2, 3$

BOSS LEVEL

Boss

a) $x^4 + 4 = (x^2 - 2x + 2)(x^2 + 2x + 2)$

b) $n = 1$ only ($1^4 + 4 = 5$); for $n \geq 2$ both factors are greater than 1

c) 65

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