Rational Expressions

Answer Key

1) Answer: B
Explanation: Recall that to simplify a rational expression, we factor both the numerator and the denominator. Then, we cancel out each common factor that we see between the two.

The given rational expression was $\frac{x^2-1}{x^2+2x+1}$. We can factor its numerator (which is $x^2 - 1$) as $(x + 1)(x - 1)$ (we use difference of two squares)

Meanwhile, we can factor the denominator (which is $x^2 + 2x + 1$) as $(x + 1)(x + 1)$.

Thus, we rewrite the given expression as follows:

$$\frac{x^2-1}{x^2+2x+1}$$

$$\frac{(x+1)(x-1)}{(x+1)(x+1)}$$

Note that the factor $x + 1$ is a common factor to both the numerator and the denominator. Thus, we should cancel this factor.

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

After cancellation, we have obtained (x - 1)/(x + 1).

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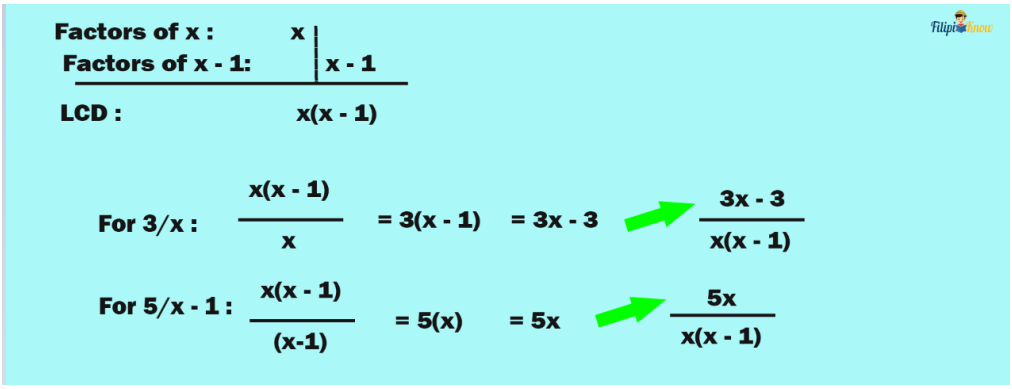
2) Answer: C

Explanation: The given rational expressions are dissimilar. So, we have to make them similar first using the Least Common Denominator (LCD) before adding them:

The LCD is x(x - 1)

Making the denominators similar:



Now, the fractions we have obtained are similar so we can proceed to addition of similar rational expressions:

$$\frac{3x-3}{x(x-1)} + \frac{5x}{x(x-1)}$$

$$\frac{(3x-3)+5x}{x(x-1)}$$

$$\frac{8x-3}{x(x-1)} = \frac{8x-3}{x^2-x}$$

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Thus, the sum of the given rational expressions is $\frac{8x-3}{x^2-x}$.

3) Answer: A

Explanation: To multiply rational expressions, we just multiply the numerators and use the resulting expression as the numerator of the product and multiply the denominators and use the resulting expression as the denominator of the product. Afterward, we simplify the result, if possible.

If you look closely at the given expressions:

$$\frac{x+1}{x} \bullet \frac{3}{x+1}$$

Notice that we can cancel out *x + 1* since it is a common factor.

$$\frac{x+1}{x} \bullet \frac{3}{x+1}$$

$$\frac{\cancel{x+1}}{x} \bullet \frac{3}{\cancel{x+1}}$$

$$\frac{3}{x}$$

Thus, the product is 3/x .

4) Answer: A
Explanation: The given expressions are similar rational expressions which implies that we can just add the numerators and then copy the common denominator to determine their sum:

Adding the numerators of the given expressions:

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

Copy the common denominator.

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

The result we have obtained is already in simplified form so no need to simplify it.

Thus, the answer is $\frac{2x+1}{2x^2+3x-1}$.

5) Answer: D
Explanation: To divide rational expressions, we take first the reciprocal of the divisor or the second rational expression, then multiply it to the first rational expression.

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The divisor given in the problem is $\frac{27}{y^2}$. Note that to obtain the reciprocal of a rational expression (or a fraction), we just interchange the positions of its numerator and the denominator. Therefore, the reciprocal of $\frac{27}{y^2}$ is simply $\frac{y^2}{27}$.

We then multiply the rational expression $\frac{y^2}{27}$ (the reciprocal of the second rational expression) to the first rational expression which is $\frac{3}{y}$:

$$\frac{3}{y} \times \frac{y^2}{27}$$

Multiplying the numerators:

$$\frac{3}{y} \times \frac{y^2}{27} = \frac{3y^2}{}$$

Multiplying the denominators:

$$\frac{3}{y} \times \frac{y^2}{27} = \frac{3y^2}{27y}$$

From our calculation above, the resulting expression is $\frac{3y^2}{27y}$. Take note that we can simplify this expression by canceling the common factors of the numerator and the denominator.

If we express both the numerator and the denominator as product of their prime factors, we have the following:

$$\frac{3y^2}{27y} = \frac{3 \times y \times y}{3 \times 3 \times 3 \times y}$$

We can cancel the common factor 3 and the common factor *y* both in the numerator and in the denominator, thus we have:

$$\frac{3y^2}{27y} = \frac{\cancel{3} \times \cancel{y} \times y}{3 \times 3 \times \cancel{3} \times \cancel{y}}$$

$$\frac{3y^2}{27y} = \frac{y}{3 \times 3} = \frac{y}{9}$$

Therefore, the final answer should be $\frac{y}{9}$.