

## Application

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1. The volume of a pyramid is equal to  $2x^2 + 3x - 9$ . If the height of the pyramid is  $6x + 18$ , determine a simplified expression to represent the area of the base. Do not state restrictions.

$$\begin{aligned} \frac{V}{1} &= \frac{A \cdot h}{3} \\ 3V &= \frac{A \cdot h}{h} \\ A &= \frac{3V}{h} \end{aligned}$$

Hint:  $\text{Volume} = \frac{\text{area of the base} \cdot \text{height}}{3}$

$$\begin{aligned} A &= \frac{3(2x^2 + 3x - 9)}{6x + 18} \\ &= \frac{18(2x - 3)(x + 3)}{2 \cdot 9(x + 3)} \\ &= \frac{2x - 3}{2} \end{aligned}$$

$$\begin{aligned} &2x^2 + 3x - 9 \\ &= 2x^2 + 6x - 3x - 9 \quad \left\{ \begin{array}{l} P(-18) \\ S(3) \end{array} \right. \\ &= 2x(x + 3) - 3(x + 3) \\ &= (2x - 3)(x + 3) \quad \left. \begin{array}{l} P(-3) \\ S(3) \end{array} \right. \end{aligned}$$

2. Given the following defined functions for  $f(x)$  and  $g(x)$ :

$$f(x) = x^2 - 2x$$

$$g(x) = 4x - 4$$

Create a simplified equation for  $h(x)$  and state all restrictions if:

$$h(x) = \frac{f(2x)}{g(2x^2 - x)}$$

$$\begin{aligned} f(2x) &= (2x)^2 - 2(2x) \\ &= 4x^2 - 4x \end{aligned}$$

$$\begin{aligned} g(2x^2 - x) &= 4(2x^2 - x) - 4 \\ &= 8x^2 - 4x - 4 \end{aligned}$$

$$h(x) = \frac{4x^2 - 4x}{8x^2 - 4x - 4}$$

$$\begin{aligned} &= \frac{4x(x-1)}{4(2x^2 - x - 1)} \quad \left\{ \begin{array}{l} P(-2) \quad \left\{ \begin{array}{l} -2, 1 \end{array} \right. \\ S(-1) \end{array} \right. \\ &= \frac{4x(x-1)}{4(2x^2 - x - 1)} \quad \left\{ \begin{array}{l} 2x^2 - x - 1 \\ = 2x^2 - 2x + x - 1 \\ = 2x(x-1) + 1(x-1) \\ = (2x+1)(x-1) \end{array} \right. \\ &= \frac{4x(x-1)}{4(2x+1)(x-1)} \end{aligned}$$

$$= \frac{x}{2x+1}, \quad x \neq 1, -\frac{1}{2}$$

3. Simplify the following rational expression and state all restrictions.

$$\frac{6x^2 + 21x - 12}{12x - 6}$$

$$= \frac{3(2x-1)(x+4)}{2 \cdot 3(2x-1)}$$

$$= \frac{x+4}{2}, x \neq \frac{1}{2}$$

I should have  
common factored  
first... oops

$$\begin{aligned} &\rightarrow 6x^2 + 21x - 12 \quad P(-72) \\ &= 6x^2 + 24x - 3x - 12 \quad S(21) \\ &= 6x(x+4) - 3(x+4) \quad \underline{24, -3} \\ &= (6x-3)(x+4) \\ &= 3(2x-1)(x+4) \end{aligned}$$