

Multiply fractions: $\frac{a \times b}{c} = \frac{a \times b}{c}$

$$= \frac{2 \times 3k^3}{3k}$$

Cancel the common factor: 3

$$= \frac{2k^3}{k}$$

Cancel common factor k

$$= 2k^2$$

$$k(k+6) = 9 + 2k^2$$

Solve $k(k+6) = 9 + 2k^2 : k = 3$

$$k(k+6) = 9 + 2k^2$$

Expand $k(k+6) : k^2 + 6k$

$$k^2 + 6k = 9 + 2k^2$$

Subtract $2k^2$ from both sides

$$k^2 + 6k - 2k^2 = 9 + 2k^2 - 2k^2$$

Simplify

$$-k^2 + 6k = 9$$

Subtract 9 from both sides

$$-k^2 + 6k - 9 = 9 - 9$$

Simplify

$$-k^2 + 6k - 9 = 0$$

Solve with quadratic formula $ax^2 + bx + c = 0$ solution $x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

for $a = -1, b = 6, c = -9 ; k_{1,2} = \frac{-6 \pm \sqrt{6^2 - 4(-1)(-9)}}{2(-1)}$

$$6^2 - 4(-1)(-9) = 0$$

$$k_{1,2} = \frac{-6 \pm \sqrt{0}}{2(-1)}$$

$$k = \frac{-6}{2(-1)}$$

$$\frac{-6}{2(-1)} = 3$$

$$k = 3$$

verify solutions

find singularity points: $k = 0$

$$\frac{k+6}{3k^2} - \left(\frac{3}{k^3} + \frac{2}{3k} \right) \text{ compare to ZERO}$$

Solve $3k^2 = 0 : k = 0$

Solve $k^3 = 0 : k = 0$

Solve $3k = 0 : k = 0$

following points are undefined

$$k = 0, k = 0, k = 0$$

Combine undefined points with solutions:

$$k = 3$$