

## Answer on Question #78908 – Math – Differential Equations

### Question

Find the general solution of

$$(y + 2xz)z_x - (x + 2yz)z_y = \frac{1}{2}(x^2 - y^2), \quad x \in \mathbb{R}; y > 0$$

### Solution

$$\frac{dx}{y + 2xz} = \frac{-dy}{x + 2yz} = \frac{dz}{\frac{1}{2}(x^2 - y^2)}$$

$$\frac{dx - dy}{y + x + 2z(x + y)} = \frac{dz}{\frac{1}{2}(x^2 - y^2)}$$

$$\frac{d(x - y)}{(x + y)(2z + 1)} = \frac{2dz}{x^2 - y^2}$$

$$\frac{d(x - y)}{2z + 1} = \frac{2dz}{x - y}$$

$$\int (x - y)d(x - y) = 2 \int (2z + 1)dz$$

**Answer:**  $\frac{(x-y)^2}{2} = 2(z^2 + z) + C.$