**Answer on Question #50307 – Math - Algebra**

xp+3yp=2(z-x2p2) solve this equation.

**Solution**

$$xp + yp = 2(z - x^2p^2)$$

Solve for $x$

(other values of $y, z, p$ should be known in order to get a definite solution):
$2p^2x^2 + px + (yp - 2z) = 0$ is a quadratic equation with respect to $x$, when $p \neq 0$ ;

its discriminant is $D1 = p^2 - 4 \cdot 2p^2(yp - 2z) = p^2 - 8yp^3 + 16zp^2$

Solutions are the following:

If $p \neq 0$, then

$x = \frac{-p \pm \sqrt{D1}}{2 \cdot 2p^2} = \frac{-p \pm p\sqrt{1-8yp+16z}}{4p^2} = -\frac{1}{4p} - \frac{1}{4p}\sqrt{1 - 8yp + 16z}; -\frac{1}{4p} - \frac{1}{4p}\sqrt{1 - 8yp + 16z}$ .

If $p = 0$, then $0 = 2z$, hence

$x = C$ is an arbitrary real number, $y = E$ is an arbitrary real number, $z = 0$ .

Solve for $y$

(other values of $x, z, p$ should be known in order to get a definite solution):

$xp + yp = 2(z - x^2p^2)$ is a linear equation with respect to $y$.

If $p \neq 0$, then $xp + yp = 2(z - x^2p^2) \Longrightarrow |subtract\ xp\ from\ both\ sides| \Longrightarrow$

$$\Longrightarrow yp = 2(z - x^2p^2) - xp \Longrightarrow |divide\ both\ sides\ by\ p| \Longrightarrow$$

$y = \frac{2(z-x^2p^2)-xp}{p} = \frac{2z}{p} - 2x^2p - x$

If $p = 0$, then $0 = 2z$, hence

$y = E$ is an arbitrary real number, $x = C$ is an arbitrary real number, $z = 0$ .

Solve for $z$

(other values of $x, y, p$ should be known in order to get a definite solution):

$xp + yp = 2(z - x^2p^2)$ is a linear equation with respect to $z$;

$\Longrightarrow |add\ 2x^2p^2\ to\ both\ sides| \Longrightarrow xp + yp + 2x^2p^2 = 2z \Longrightarrow |divide\ both\ sides\ by\ 2| \Longrightarrow$
$\frac{xp+yp+2x^2p^2}{2} = z$, i.e. $z = \frac{xp+yp+2x^2p^2}{2}$

Solve for $p$

(other values of $x, y, z$ should be known in order to get a definite solution):
$2x^2p^2 + (x + y)p - 2z = 0$ is a quadratic equation with respect to $p$, when $x \neq 0$;

its discriminant is $D2=(x+y)^2-4\cdot 2x^2\cdot(-2z)=x^2+y^2+2xy+16x^2z$

Solutions are the following:

If $x\neq 0$, then

$$p=\frac{-(x+y)\pm\sqrt{D2}}{2\cdot 2x^2}=\frac{-(x+y)\pm\sqrt{x^2+y^2+2xy+16x^2z}}{4x^2}=\frac{-(x+y)-\sqrt{x^2+y^2+2xy+16x^2z}}{4x^2};\frac{-(x+y)+\sqrt{x^2+y^2+2xy+16x^2z}}{4x^2}.$$

If $x=0$, then $yp=2z$ is a linear equation with respect to $p$, hence

If $x=0$ and $y\neq 0$, then $p=\frac{2z}{y}$ ;

If $x=0$ and $y=0$ and $z\neq 0$, then the equation does not have solutions

If $x=0$ and $y=0$ and $z=0$, then the equation has infinitely many solutions, i.e. $p=K$, where $K$ is an arbitrary real constant.

Note that there are infinitely many solutions when two or less values of $x,y,z,p$ are known, they should satisfy condition $z\geq\frac{xp+yp}{2}$.