1. Find $y'''|_{x=1}$ if y is a differentiable function of x satisfying the identity $y^3 + xy + x^2 = 1$.

$\boxed{x=1}$

$y^3 + y + 1 = 1$

$\Downarrow$

$y(y^2+1) = 0$

$\Downarrow$

$y = 0$

d/dx

$3y^2 y' + y + xy' + 2x = 0$

$\boxed{x=1, y=0}$

$0 + 0 + y' + 2 = 0$

$\Downarrow$

$y' = -2$

d/dx

$6y(y')^2 + 3y^2 y'' + y' + y' + xy'' + 2 = 0$

$\boxed{x=1, y=0, y'=-2}$

$0 + 0 + (-2) + (-2) + y'' + 2 = 0$

$\Downarrow$

$y'' = 2$

d/dx

$6(y')^3 + 12yy'y'' + 6yy'y'' + 3y^2 y''' + 2y'' + y'' + xy''' = 0$

$\boxed{x=1, y=0, y'=-2, y''=2}$

$-48 + 0 + 0 + 0 + 4 + 2 + y''' = 0$

$\Downarrow$

$y''' = 42 \quad$ when $x = 1$