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MAP 2302 Quiz 15
Tuesday October 29th

Find the first four nonzero terms in the Taylor series for the solution to the initial value problem.

$$y' = x^2 + y, \qquad y(0) = 1$$

$$\downarrow$$

$$y'' = 2x + y'$$
$$y''' = 2 + y''$$

$$\Rightarrow \quad y(0) = 1$$

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

$$y''(0) = 2 \cdot 0 + y'(0) = 0 + 1 = 1$$

$$y'''(0) = 2 + y''(0) = 2 + 1 = 3$$

First four nonzero terms of Taylor series are

$$y(0) + y'(0)x + \frac{y''(0)}{2!}x^2 + \frac{y'''(0)}{3!}x^3$$

$$= \quad 1 \quad + \quad 1x \quad + \quad \frac{1}{2!}x^2 + \frac{3}{3!}x^3$$

$$\text{or} \quad 1 + x + \frac{x^2}{2} + \frac{3x^3}{6} \quad \text{or} \quad 1 + x + \frac{x^2}{2} + \frac{x^3}{2}$$