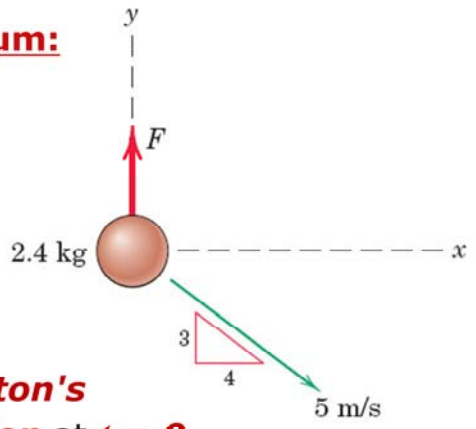
Linear Impulse-Momentum: Yet Another Exercise



A **2.4-kg** particle moves in the ***x-y* plane** and has the **velocity** shown at time $t = 0$. A **force $F = 2+3t^2/4$ Newton's** is applied in the ***y*-direction** at $t = 0$.

Determine the **velocity** of the particle **4 seconds** after F is applied and specify the **angle θ** measured counter clockwise from the ***x*-axis** to the **direction** of the **velocity**.

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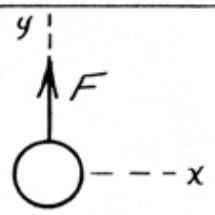

$\int \Sigma F_y \, dt = \Delta G_y$:

$$\int_0^4 \left(2 + \frac{3t^2}{4}\right) dt = 2.4\left(v_y - \left[-\frac{3}{5}5\right]\right)$$

$$2t + \frac{t^3}{4}\Big|_0^4 = 2.4\,(v_y + 3), \quad v_y = 7 \text{ m/s}$$

$\int \Sigma F_x \, dt = \Delta G_x$: $0 = 2.4\left(v_x - \frac{4}{5}5\right)$, $v_x = 4$ m/s constant

$v = \sqrt{4^2 + 7^2} = \underline{8.06 \text{ m/s}}$, $\theta = \tan^{-1}\frac{7}{4} = \underline{60.3^\circ}$