

$$5) \quad SA = \int_a^b 2\pi r \, ds \quad \text{about } y\text{-axis.}$$

$$r = x$$

$$= \int_0^1 2\pi (3t - t^3) \sqrt{(3 - 3t^2)^2 + (6t)^2} \, dt$$

$$= \int_0^1 2\pi (3t - t^3) \sqrt{9 - 18t^2 + 9t^4 + 36t^2} \, dt$$

$$= \int_0^1 2\pi (3t - t^3) \sqrt{9 + 18t^2 + 9t^4} \, dt$$

$$= \int_0^1 2\pi (3t - t^3) \sqrt{(3 + 3t^2)^2} \, dt$$

$$= \int_0^1 2\pi (3t - t^3) (3 + 3t^2) \, dt$$

$$= 2\pi \int_0^1 9t + 9t^3 - 3t^3 - 3t^5 \, dt$$

$$= 2\pi \int_0^1 9t + 6t^3 - 3t^5 \, dt = 2\pi \left(\frac{9t^2}{2} + \frac{6t^4}{4} - \frac{3t^6}{6} \right) \Big|_0^1$$

$$= 2\pi \left(\frac{9}{2} + \frac{6}{4} - \frac{1}{2} \right)$$