1. Find the following indefinite integrals

(a)
$$\int x (1+x^2)^5 dx$$

(b) $\int \sinh^4 x \cosh x \, dx$

$$\frac{dt}{dt} = \sinh x$$

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$$\int t^{4} \frac{\cosh x}{\cosh x} dt$$

$$\int t^{4} dt$$

$$\frac{t^{5}}{5} + K = \sinh x + K$$

2. Evaluate $\int_0^{\pi/2} \frac{\sin x}{1 + \cos x} dx$

$$\int_{2}^{1} \frac{\sin x}{t} \frac{dt}{-\sin x} \frac{dt}{dt} = -\sin x$$

$$-1 \int_{2}^{1} \frac{1}{t} dt$$

$$-\left[\ln t\right]_{2}^{1}$$

$$= \ln 2$$

3. Use the substitution $u = \sqrt{x}$ to evaluate $\int_0^4 e^{\sqrt{x}} dx$

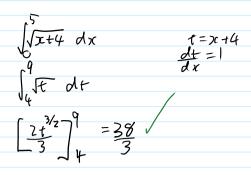
$$\int_{0}^{2} e^{u} \frac{da}{\frac{1}{2}x^{-1/2}} \frac{du = \frac{1}{2}x^{-1/2}}{dx = \frac{1}{2}x^{-1/2}}$$

$$\int xe^{ax} dx = \left(\frac{x}{a} - \frac{1}{a^{2}}\right)e^{ax}$$

$$2 \int ue^{u} du = 2\left[\left(u - 1\right)e^{u}\right]_{0}^{2}$$

$$= 16.778$$

4. Find the magnitude of the area enclosed between the curve $y = \sqrt{x+4}$, the x-axis and the lines x = 0 and x = 5.



- 5. The area bounded by the curve y = x(x-1), the x-axis and the lines x = 0 and x = 1 is rotated about the x-axis through one complete revolution.
 - (i) Find the volume of the solid of revolution.

$$V = \pi \int_{0}^{1} x^{4}(x-1)^{2} dx$$

$$\int_{0}^{1} x^{4} - 2x^{3} + x^{2} dx$$

$$\pi \left[\frac{x^{5}}{5} - \frac{x^{4}}{2} + \frac{x^{5}}{3} \right]_{0}^{1} = \pi / 3$$

(ii) Find the coordinates of the centre of gravity of this solid.

$$y = x(x - 1)$$

$$x = 0 - 1$$

$$x = 30\pi \left(\frac{x^{6} - 2x^{5} + x^{4}}{5} \right)^{1} = \frac{1}{2}$$

$$\left(\frac{1}{2}, 0 \right)$$