

**Graphing Calculator!!! Show all work. Give exact answers unless otherwise directed.**

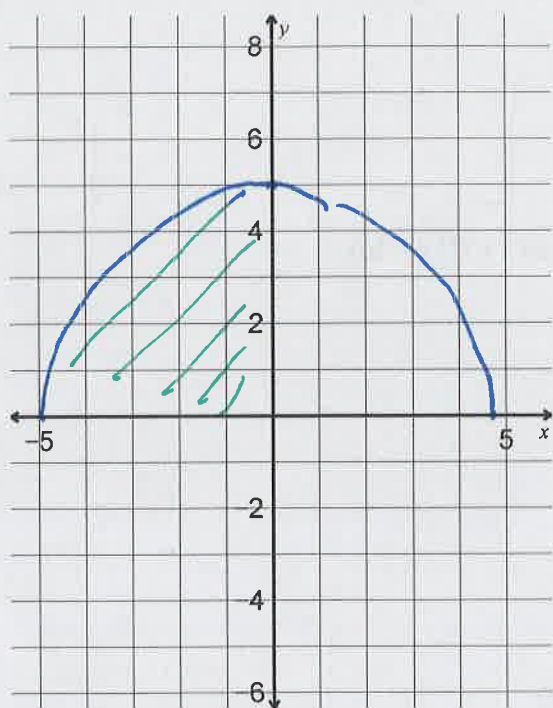
1. Use 20 right-hand rectangles to approximate  $\int_1^6 \ln x dx$ .

$$\Delta x = \frac{6-1}{20} = \frac{5}{20} = \frac{1}{4}$$

Sigma Notation: 
$$\sum_{k=1}^{20} \frac{1}{4} \ln \left[ 1 + \frac{1}{4}k \right]$$

Rounded to 4 decimal places: 5.97 units<sup>2</sup>

2. a. Sketch an accurate graph of  $y = \sqrt{25 - x^2}$ .



b. Hence use area formulas to find the exact value

$$\text{of } \int_{-5}^0 \sqrt{25 - x^2} dx.$$

$$= \frac{1}{4} \pi (5)^2 = \boxed{\frac{25}{4} \pi}$$

3. Given  $\int_2^7 (x^2 + 5) dx$ ;

$$\Delta x = \frac{7-2}{20} = \frac{1}{4}$$

a) Approximate to 3. S. f. by 20 left-hand rectangles. Show your work in sigma notation.

$$\sum_{k=1}^{20} \frac{1}{4} \left( 2 + \frac{1}{4}k \right)^2 = 131$$

b) Evaluate it using FTC. Show your work.

$$\int_2^7 (x^2 + 5) dx = \left. \frac{1}{3} x^3 + 5x \right|_{x=2}^{x=7} = \left[ \frac{1}{3} (7)^3 + 5(7) \right] - \left[ \frac{1}{3} (2)^3 + 5(2) \right]$$
$$= \frac{410}{3} = 136.\bar{6}$$

4. Finding the antiderivatives.

a.  $\int \sqrt{7x+4} dx$

$= \int (7x+4)^{\frac{1}{2}} dx$

$= \frac{2}{21} (7x+4)^{3/2} + C$

b.  $\int \cos 3x - 2e^{5x-3} dx$

$= \frac{1}{3} \sin 3x - \frac{2}{5} e^{5x-3} + C$

c.  $\int \frac{x^3 - \sqrt{x} + 10}{x^2} dx$

$= \int (x - x^{-3/2} + 10x^{-2}) dx$

$= \frac{1}{2} x^2 + \frac{2}{\sqrt{x}} - \frac{10}{x} + C$

d.  $\int \sqrt{5x^2 + 4} dx$

$= \int (x^{\frac{5}{2}} + (5x-1)^{\frac{1}{4}}) dx$

$= \frac{2}{7} x^{\frac{7}{2}} + \frac{4}{25} (5x-1)^{\frac{5}{4}} + C$

5.  $f(x) = \int \sqrt{x} + \frac{1}{x} dx$  Find  $f(x)$  when it passes through (1, 5)

$F(x) = \frac{2}{3} x^{\frac{3}{2}} + \ln x + C$

$F(1) = \frac{2}{3} (1)^{\frac{3}{2}} + \ln(1) + C = 5$

$\Rightarrow F(x) = \frac{2}{3} x^{\frac{3}{2}} + \ln x + \frac{13}{3}$

$C = \frac{13}{3}$