

1. Calculate the arc length of the curve  $y = 2(x + 1)^{3/2}$  over the interval  $[0, 1]$ .

2. (a) Evaluate

$$\int \frac{6 dx}{(x + 1)(x + 3)}$$

(b) Using part (a), evaluate

$$\int_0^{\infty} \frac{6 dx}{(x + 1)(x + 3)}$$

3. Determine the limit of the sequence or show that the sequence diverges:

$$(a) a_n = \frac{n!}{3^n} \qquad (b) a_n = n \sin\left(\frac{\pi}{2n}\right)$$

4. (a) Find the partial fraction decomposition of

$$\frac{2}{x^2 + 3x + 2}$$

(b) Calculate the partial sums  $S_3$  and  $S_4$  of the series

$$\sum_{n=1}^{\infty} \frac{2}{n^2 + 3n + 2}$$

(Hint: Use part (a).)

(c) Find the sum  $S$  of the series of part (b).

5. Evaluate the improper integrals

$$(a) \int_2^3 \frac{dx}{\sqrt{x-2}} \qquad (b) \int_1^{\infty} \frac{dx}{\sqrt{x}e^{\sqrt{x}}}$$