

1. Evaluate the following integrals.

$$(a) \int \frac{4x^2 + 3}{x^2 + 1} dx$$

$$(b) \int \sqrt{x} \ln x dx$$

$$(c) \int \sin^{-1} x dx$$

$$(d) \int 10x^3 \cos x dx$$

$$(e) \int \sec^6 x dx$$

$$(f) \int \frac{x^3}{\sqrt{4 + x^2}} dx$$

$$(g) \int \frac{6x^2 - 3x + 1}{(x^2 + 1)(x - 1)} dx$$

$$(h) \int_0^9 \frac{1}{\sqrt{9 - x}} dx$$

$$(i) \int \frac{(\sin x + \cos x)^2 - 1}{\tan^4 x} dx$$

2. Find a general formula for a_n , the n th term of the following sequence. Does this sequence converge or diverge? Explain. If the sequence converges, be sure to find its limit.

$$-\frac{\cos 1}{2}, \frac{\cos 2}{4}, -\frac{\cos 3}{6}, \frac{\cos 4}{8}, -\frac{\cos 5}{10}, \frac{\cos 6}{12}, -\frac{\cos 7}{14}, \dots$$

3. Prove that the sequence below is either strictly increasing or strictly decreasing.

$$\frac{n^n}{n!}$$