

CALCULUS OPTION (Q 8, PAPER 2)

2008

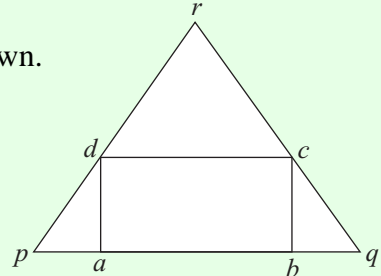
8 (a) Use the ratio test to show that $\sum_{n=1}^{\infty} \frac{2^{3n+1}}{n!}$ is convergent.

(b) pqr is an equilateral triangle of side 6 cm.
 $abcd$ is a rectangle inscribed in the triangle as shown.

$|ab| = x$ cm and $|bc| = y$ cm.

(i) Express y in terms of x .

(ii) Find the maximum possible area of $abcd$.



(c) (i) Derive the Maclaurin series for $f(x) = \cos x$, up to and including the term containing x^4 .

(ii) Hence, or otherwise, show that the first three non-zero terms of the

Maclaurin series for $f(x) = \cos^2 x$ are $1 - x^2 + \frac{x^4}{3}$.

(iii) Use these to find an approximation for $\cos^2(0.2)$, giving your answer correct to four decimal places.

ANSWERS

8 (b) (i) $y = \sqrt{3}(3 - \frac{x}{2})$ (ii) $\frac{9}{2}\sqrt{3}$ cm²

(c) (i) $1 - \frac{x^2}{2} + \frac{x^4}{24}$ (iii) 0.9605