

7 Let $f(x) = \frac{\cos x}{1 + \sin x}$.

(b) Find $\int_{\frac{1}{6}\pi}^{\frac{1}{2}\pi} f(x) \, dx$. Give your answer in a simplified exact form.

[4]

[illegible]

- 4 (a) Prove that $\frac{1 - \cos 2\theta}{1 + \cos 2\theta} \equiv \tan^2 \theta$. [2]

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- (b) Hence find the exact value of $\int_{\frac{1}{6}\pi}^{\frac{1}{3}\pi} \frac{1 - \cos 2\theta}{1 + \cos 2\theta} d\theta$. [4]

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- 6 (a)** Using the expansions of $\sin(3x + 2x)$ and $\sin(3x - 2x)$, show that

$$\frac{1}{2}(\sin 5x + \sin x) \equiv \sin 3x \cos 2x. \quad [3]$$

[illegible]

(b) Hence show that $\int_0^{\frac{1}{4}\pi} \sin 3x \cos 2x \, dx = \frac{1}{5}(3 - \sqrt{2})$. [3]

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- 6 (a) Prove that $\operatorname{cosec} 2\theta - \cot 2\theta \equiv \tan \theta$.

[3]

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- (b) Hence show that $\int_{\frac{1}{4}\pi}^{\frac{1}{3}\pi} (\operatorname{cosec} 2\theta - \cot 2\theta) \, d\theta = \frac{1}{2} \ln 2$.

[4]

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