

SPECIALIST MATHEMATICS UNIT 4
SAC 3: INTEGRAL CALCULUS AND APPLICATIONS TEST

NAME: _____

PAPER ONE: Technology Free

Time: 45 Minutes

Total: 40 marks

Question 1 (4 marks)

Find $\int \cos(x) \sin(2x) dx$

Question 2 (6 marks)

Use the substitution $u = 3 - x^3$ to find the exact value of $\int_0^1 \frac{x^5}{3 - x^3} dx$.

Question 3 (5 marks)

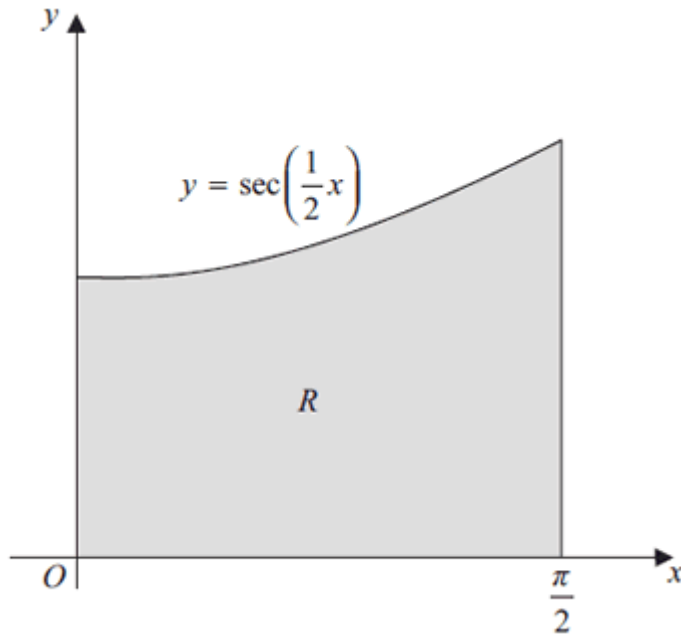
Find $\int \frac{x+7}{(x+2)(x-3)} dx$.

Question 4 (8 marks)

Use the substitution $u = \tan x$ to find the exact value of $\int_0^{\frac{\pi}{4}} \sec^4 x \sqrt{\tan x} dx$

Question 5 (4 marks)

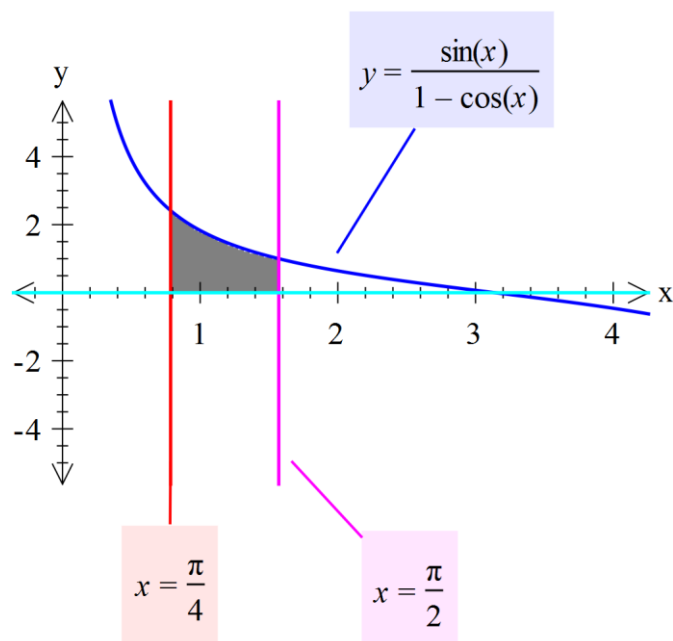
The diagram below shows region R bounded by the x -axis, the y -axis, the line $x = \frac{\pi}{2}$ and the curve with equation $y = \sec\left(\frac{1}{2}x\right)$, $0 \leq x \leq \frac{\pi}{2}$.



Region R is rotated through 2π radians about the x -axis. Use calculus to find the exact volume of the solid formed.

Question 7 (5 marks)

Find the area enclosed by the graph of $y = \frac{\sin x}{1 - \cos x}$, the x -axis and the lines with equations $x = \frac{\pi}{4}$ and $x = \frac{\pi}{2}$.



Question 8 (5 + 3 = 8 marks)

a) Find the derivative of $\sin^{-1}(x) + x\sqrt{1-x^2}$.

b) Hence evaluate $\int_0^{\frac{1}{2}} \sqrt{1-x^2} dx$

END OF PAPER ONE