1) (A) $\int_0^{\frac{\pi}{2}} \sin^2 t \cos^3 t \, dt = \int_0^{\frac{\pi}{2}} \sin^2 t(1-\sin^2 t)\cos t \, dt$

$u = \sin t$
$du = \cos t \, dt$] 5 points for correct u substitution

2 points for change of limits

$= \int_0^1 u^2(1-u^2)\, du$

$= \left(\frac{1}{3}u^3 - \frac{1}{5}u^5\right)\Big|_0^1$] 2 points for correct integration

$= \frac{1}{3} - \frac{1}{5}$

$= \frac{2}{15}$] 1 point for correct answer + evaluating using limits of integration

(B) $\int \frac{x}{\sqrt{4-x^2}}\, dx = -\frac{1}{2}\int \frac{1}{\sqrt{u}}\, du = -\sqrt{u} + C$ 5 points for correct integration

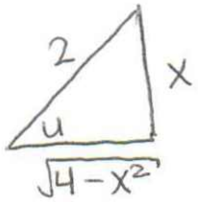
$u = 4 - x^2$
$du = -2x\, dx$
$-\frac{1}{2}du = x\, dx$

5 points for correct u substitution

$= -\sqrt{4-x^2} + \underbrace{C}_{\text{1 point}}$

5 points

Alternative soln $\int \frac{x}{\sqrt{4-x^2}}\, dx = \int \frac{2\sin u}{\sqrt{4-4\sin^2 u}} (2\cos u)\, du$



$\sin u = \frac{x}{2}$

$2\sin u = x$ $\quad x^2 = 4\sin^2 u$

$2\cos u \, du = dx$

] 7 points (triangle + substitution)

$= 2\int \frac{\sin u}{\cos u} \cos u \, du$

$= +2\int \sin u \, du$

$= -2\cos u + C$

$= -2\frac{\sqrt{4-x^2}}{2} + C$

] 5 points for correct integration

$= -\sqrt{4-x^2} + \underbrace{C}_{\text{1 point (of the 3)}}$] 3 pts for correct soln (using triangle to get soln in terms of x)