Name SOLUTION & KEY Feb 17, 2009

Math 133 — Quiz 5B

(1) (4 points) Quickly, from memory, write the integral:

(a) $\int \frac{dx}{x\sqrt{x^2-25}} = \frac{1}{5}\sec^{-1}\left(\frac{x}{5}\right)+C$

arcsec (1 pt)

5's included in right place (+1)

(b) $\int \cosh u\, du = \sinh u + C$ (2 pts)

(2) (4 points) Find $\int \frac{dt}{\sqrt{-t^2+4t-3}}$.

$-(t^2-4t)-3$

$-[(t-2)^2-4]-3$

$1-(t-2)^2$

Complete the square (+2)

$= \int \frac{dt}{\sqrt{1-(t-2)^2}}$

$\begin{bmatrix} u = t-2 \\ du = dt \end{bmatrix}$ substitute (+1)

$= \int \frac{du}{\sqrt{1-u^2}}$ (+1)

$= \sin^{-1}(u)+C = \sin^{-1}(t-2)+C$

(3) (4 points) Use integration by parts to find $\int \arctan(t)\, dt$.

by parts 2 pts

$\begin{bmatrix} u = \arctan t & dv = dt \\ du = \frac{dt}{1+t^2} & v = t \end{bmatrix}$

$\int \arctan(t)\, dt = t\arctan(t) - \int \frac{t\, dt}{1+t^2}$

$u = 1+t^2$

$du = 2t\, dt$

$\frac{1}{2}du = t\, dt$

substitute 1 pt

$= t\arctan(t) - \frac{1}{2}\int \frac{du}{u}$

$= t\arctan(t) - \frac{1}{2}\ln|u| + C$

$= t\arctan(t) - \frac{1}{2}\ln(1+t^2) + C$

finish 1 pt