KEY

(22)

Name: KEY	ID: KEY	Sec: 9AM , 10AM

MATH-102 Term-152 **CQ9** **(show all your work & write final answer in the box)**

1) Determine whether the integral is convergent or divergent. If it is convergent, find its value.

$$I = \int_0^\infty \frac{e^x}{e^{2x}+3}\,dx \qquad u = e^x \rightarrow du = e^x dx$$

$$I = \int_1^\infty \frac{du}{u^2+3} = \lim_{t\to\infty} \int_1^t \frac{du}{u^2+3} \quad (4)$$

$$= \lim_{t\to\infty} \left[\frac{1}{\sqrt{3}} \tan^{-1}\frac{u}{\sqrt{3}}\right]_1^t$$

$$= \lim_{t\to\infty} \left[\frac{1}{\sqrt{3}} \tan^{-1}\frac{t}{\sqrt{3}} - \frac{1}{\sqrt{3}} \tan^{-1}\frac{1}{\sqrt{3}}\right]$$

$$= \frac{1}{\sqrt{3}} \lim_{t\to\infty} \left[\tan^{-1}\frac{t}{\sqrt{3}} - \tan^{-1}\frac{1}{\sqrt{3}}\right]$$

$$= \frac{1}{\sqrt{3}} \left[\frac{\pi}{2} - \tan^{-1}\frac{1}{\sqrt{3}}\right] \quad (5)$$

So, the integral is convg (1) and its value is $\frac{1}{\sqrt{3}}\left[\frac{\pi}{2} - \tan^{-1}\frac{1}{\sqrt{3}}\right]$

2) Match the integral with the appropriate method

$\int e^x \cos^2 x\, dx.$	g	2
$\int \frac{x+2}{(x-1)(x^2+1)}dx$	d	2
$\int x\csc^2 x \cot x dx$	c	2
$\int x(x+1)e^x dx$	f	2
$\int \sin(\ln x^2)dx$	a	2
$\int_4^6 (x^2+1)\,\mathrm{sech}(\ln x)\, dx.$	e	2

a) two integration by part then back to original
b) By part with $dv = \csc^2 x$
c) By part with $dv = \csc^2 x \cot x$
d) Partial fraction
e) Simplify the integrand to become $2x$
f) Integration by part several times
g) Trig. Identity then two integration by part then back to original
h) Trig substitution with $u = \cot x$
i) By part with $u = \sec h(x)$