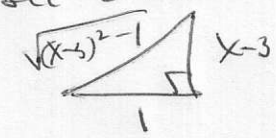
MATH 152 **QUIZ 4A** NAME Answers
Mrs. Bonny Tighe 25 points
8.4, 8.5 SECTION _____ Wed 3/8/06

1. Evaluate the integrals. a)

$$\int \frac{dx}{\sqrt{x^2-6x+10}} = \int \frac{dx}{\sqrt{(x-3)^2+1}}$$

$x-3 = \tan\theta$
$dx = \sec^2\theta\, d\theta$



$$\int \frac{\sec^2\theta\, d\theta}{\sqrt{\tan^2\theta+1}} = \int \frac{\sec^2\theta\, d\theta}{\sec\theta}$$

$$\int \sec\theta\, d\theta = \ln|\sec\theta + \tan\theta| + C$$

$$\ln\left|\sqrt{(x-3)^2-1} + (x-3)\right| + C$$

b) $\int \frac{e^{2x}}{e^{2x}+3e^x-4}dx = \int \frac{u^2}{u^2+3u-4}\left(\frac{1}{u}du\right) = \int \frac{u\,du}{(u+4)(u-1)}$

$u = e^x$
$\ln u = x$
$\frac{1}{u}du = dx$

$$\frac{A}{u+4} + \frac{B}{u-1} = \frac{u}{(u+4)(u-1)} \qquad A(u-1)+B(u+4) = u$$

$u = 1$ $\quad 5B = 1$ $\quad B = 1/5$
$u = -4$ $\quad -5A = -4$ $\quad A = 4/5$

$$\frac{4}{5}\int \frac{1}{u+4}du + \frac{1}{5}\int \frac{1}{u-1}du =$$

$$\frac{4}{5}\ln|u+4| + \frac{1}{5}\ln|u-1| + C$$

$$\frac{4}{5}\ln|e^x+4| + \frac{1}{5}\ln|e^x-1| + C$$

c) $\int_0^3 \frac{2x-3}{x+1}dx =$ _____

$$\int_0^3 \frac{2x}{x+1}dx - \int \frac{3}{x+1}dx$$

$$\int_0^3 \left(2 - \frac{5}{x+1}\right)dx$$

$$2x - 5\ln|x+1| \Big|_0^3$$

$$(6 - 5\ln(4)) - (0 - 5\ln(1))$$

$$6 - 5\ln(4) - 0$$

$$6 - 5\ln(4)$$

$$x+1 \overline{)\,2x-3}$$

$$-(2x+2)$$

$$-5$$

d) $\int \frac{x^3+2x^2+1}{x^3-3x^2}dx$

$$\int \left(1 + \frac{5x^2+1}{x^2(x-3)}\right)dx$$

$$\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x-3} = \frac{5x^2+1}{x^2(x-3)}$$

$$Ax(x-3) + B(x-3) + Cx^2 = 5x^2+1$$

$x=0$ $\quad B(-3) = 1 \quad B = -1/3$

$x=3$ $\quad C(9) = 5(9)+1 \quad C = 46/9$

$$Ax^2 - 3Ax + Bx - 3B + Cx^2 = 5x^2$$

$$A + C = 5 \quad A = -46/9 + 5 = -1/9$$

$$x^3 - 3x^2 \overline{)\,x^3 + 2x^2 + 1}$$

$$-(x^3 - 3x^2)$$

$$+5x^2 + 1$$

$$\int 1 - \frac{1}{9}\left(\frac{1}{x}\right) - \frac{1}{3}\left(\frac{1}{x^2}\right) + \frac{46}{9}\left(\frac{1}{x-3}\right)dx$$

$$x - \frac{1}{9}\ln|x| - \frac{1}{3}\cdot\frac{1}{-1}x^{-1} + \frac{46}{9}\ln|x-3| + C$$

$$x - \frac{1}{9}\ln|x| + \frac{1}{3x} + \frac{46}{9}\ln|x-3| + C$$

$x^2+x+1/4+1-1/4$

$(x+1/2)^2+3/4$

e)

$$\int \frac{1}{x^2+x+1}dx$$

$$\int \frac{1}{(x+1/2)^2+3/4}dx = \frac{1}{\sqrt{3/4}}\tan^{-1}\left(\frac{(x+1/2)}{\sqrt{3/4}}\right)+C$$

$$\frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{2(x+1/2)}{\sqrt{3}}\right)+C$$

f) $\int \cot x \ln(\sin x)dx =$ _____

$$\int \frac{\cos x \ln(\sin x)}{\sin x}dx$$

$u = \ln(\sin x)$

$du = \frac{1}{\sin x}\cos x\,dx$

$$\int (\ln(\sin x))' \frac{\cos x}{\sin x}dx$$

$$\int u'\,du$$

$\frac{1}{2}u^2+C$

$$\frac{1}{2}(\ln(\sin x))^2+C$$