Math 172

26 May 2016

Quiz 7

Show Appropriate Work

Name: _____

Point Values in $\boxed{\text{boxes}}$.

1. $\boxed{5}$ Integrate

$$\int \frac{3x^3 + 17x^2 + 25x - 5}{(x+1)^2(x^2 + 6x + 13)}\, dx$$

given the following Partial Fraction Decomposition

$$\frac{3x^3 + 17x^2 + 25x - 5}{(x+1)^2(x^2 + 6x + 13)} = \frac{1}{1+x} - \frac{2}{(1+x)^2} + \frac{2x + 8}{x^2 + 6x + 13}.$$

$$= \int \left(\frac{1}{1+x} - \frac{2}{(1+x)^2} + \frac{2x+6}{x^2+6x+13} + \frac{2}{(x+3)^2+2^2} \right)\, dx$$

$$= \ln|1+x| + \frac{2}{1+x} + \ln(x^2+6x+13) + \arctan\left(\frac{x+3}{2}\right) + C$$

Continued on the other side.

2. $\boxed{5}$ Integrate.

$$\int \frac{3x^2 + 3x + 4}{x^3 + 4x}\, dx$$

$$\frac{3x^2 + 3x + 4}{x(x^2 + 4)} = \frac{A}{x} + \frac{Bx + C}{x^2 + 4}$$

$$3x^2 + 3x + 4 = A(x^2 + 4) + (Bx + C)x$$

Let $x = 0$, $\quad 4 = A(4) \quad$ so $\quad A = 1$

Equate coeff.

$$\underline{x^2}$$

$$3 = A + B$$

$$\underline{x}$$

$$3 = C$$

so

$$B = 2$$

so $\quad \int \frac{3x^2 + 3x + 4}{x^3 + 4x}\, dx = \int \left(\frac{1}{x} + \frac{2x}{x^2 + 4} + \frac{3}{x^2 + 4} \right) dx$

$$= \ln|x| + \ln|x^2 + 4| + \frac{3}{2}\arctan\left(\frac{x}{2}\right) + C$$