MAT 137 (Calculus II) Prof. Swift

Quiz 4, Review of Differentiation and Integration

Name: Key

For this quiz, you *may not* work with other people. You may not use calculators or any internet-connected device. You may leave the class after you turn in your quiz.

Evaluate the derivative or integral.

1. $\frac{d}{dx}e^{x\sin(x)} =$ $e^{x\sin(x)} \cdot \frac{d}{dx}(x\sin(x)) = e^{x\sin(x)}\cdot(1\sin(x) + x\cos(x))$ OK

$= e^{x\sin(x)}(\sin(x) + x\cos(x))$

2. $\int \frac{x+2}{x^2+4x+1}\,dx =$ $\int \frac{1}{u}\cdot\frac{1}{2}\,du$

To integrate a fraction try u = denominator.

$= \frac{1}{2}\int \frac{1}{u}\,du = \frac{1}{2}\ln|u| + C$

$= \frac{1}{2}\ln|x^2+4x+1| + C$

let $u = x^2+4x+1$

$du = (2x+4)\,dx$ yes!

$= 2(x+2)\,dx$

so $\frac{1}{2}du = (x+2)\,dx$

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3. $\int x\sin(2x)\,dx =$ $x\left(\frac{-1}{2}\right)\cos(2x) - \int \frac{-1}{2}\cos(2x)\,dx = \frac{-1}{2}x\cos(2x) + \frac{1}{2}\int \cos(2x)\,dx$

Parts: $u = x$ $\quad dv = \sin(2x)\,dx$

$du = dx$ $\quad v = -\frac{1}{2}\cos(2x)$

since $\frac{dv}{dx} = -\frac{1}{2}(-\sin(2x))\cdot 2$

$= \sin(2x)$

$= \frac{-1}{2}x\cos(2x) + \frac{1}{2}\cdot\frac{1}{2}\sin(2x) + C$

$= \boxed{\frac{-1}{2}x\cos(2x) + \frac{1}{4}\sin(2x) + C}$

2 is even, 3 is odd

4. $\int \sin^2(x)\cos^3(x)\,dx =$ $\int \sin^2(x)\cos^2(x)\cos(x)\,dx$

let $u = \sin(x)$

$du = \cos(x)\,dx$

$= \int \sin^2(x)(1-\sin^2(x))\cos(x)\,dx$

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

$= \int u^2 - u^4\,du = \frac{u^3}{3} - \frac{u^5}{5} + C$

$= \boxed{\frac{\sin^3(x)}{3} - \frac{\sin^5(x)}{3} + C}$