Assignment 5 Question 3
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First, the integration by substitution and parts

$$\int_{-1}^{0}(x-1)sin(3x-3)dx$$

use the integration by substitution

Assume (x-1) is a, therefore dx=da

Therefore, the function becomes $\int_{-1}^{0} asin(3a)dx$

use integration by parts

Then we assume U = a , du = 1 , dv = sin 3a , v = $\frac{-cos3a}{3}$

So $\int_{-1}^{0}(x-1)sin(3x-3)dx$ = a * $\frac{-cos3a}{3}|_{-1}^{0}$ - $\int_{-1}^{0}\frac{-cos3a}{3}*da$

= $\frac{cos(-3)}{3}+\frac{1}{9}+\frac{sin(-3)}{9}$ = -0.23456

Second, the integration with substitution and partial fraction

$$\int_{0}^{1}\frac{2u(u^4-39u^2+5)}{(u^2-4)^2(u^4+3)}*du$$

use integration by substitution

We assume u^2 = x, so 2u*du=dx

therefore = $\int_{0}^{1}\frac{2u(x^2-29x+5)}{(x-4)^2(x^2+3)}*\frac{dx}{2u}$

$=\int_{0}^{1}\frac{x^2-29x+5}{(x-4)^2(x^2+3)}dx$

use integration by partial

$=\int_{0}^{1}\frac{A}{x-4}+\frac{B}{(x-4)^2}+\frac{C}{x^2+3}dx$

$=\int_{0}^{1}\frac{1}{x-4}+\frac{5}{(x-4)^2}+\frac{-x+2}{x^2+3}dx$

$=\int_{0}^{1}\frac{1}{x-4}-\frac{5}{(x-4)^2}-\frac{x}{x^2+3}+\frac{2}{x^2+3}dx$

= -$\frac{5}{12}+\frac{\pi}{3\sqrt{3}}In(\frac{3\sqrt{3}}{8}$

Third, the integration with partial and parts

$$\int_{0}^{1}log(x-1)\frac{-2}{(x+2)^2}$$

using integration by parts

We assume u = log(x-1) , du = $\frac{1}{x-1}, v=\frac{x+4}{x+2}, dv=\frac{-2}{(x+2)^2}$

$$\int_0^1 log(x-1)\frac{-2}{(x+2)^2} = log(x-1) * \frac{x+4}{x-2}|_0^1 - \int_0^1 \frac{x+4}{x+2}\frac{1}{x-1}$$

using integration by partial

$log(x-1) * \frac{x+4}{x+2}|_0^1 - \int_0^1 \frac{x+4}{(x+2)(x-1)}$

$= log(x-1) * \frac{x+4}{x+2}|_0^1 - \int_0^1 \frac{A}{x+2} + \frac{B}{x-1}$

A=2 , B=3

$= log(x-1) * \frac{x+4}{x+2}|_0^1 - \int_0^1 \frac{2}{x+2} + \frac{3}{x-1}$

$= \frac{1}{3(In(\frac{9}{4})-i\pi)}$