MA 114 Worksheet #01: Integration by parts

1. For each of the following integrals, determine if it is best evaluated by integration by parts or by substitution. If the integral should be evaluated by substitution, give the substition you would use. You do not need to find the anti-derivatives.

   (a) $\int x\cos(x^2)\,dx$,

   (b) $\int e^x \sin(x)\,dx$,

   (c) $\int \frac{\ln(\arctan(x))}{1+x^2}dx$,

   (d) $\int xe^{x^2}\,dx$

2. Find the following indefinite integrals using integration by parts:

   (a) $\int x^2\sin(x)\,dx$,

   (b) $\int (2x+1)e^x\,dx$,

   (c) $\int 2x\arctan(x)\,dx$,

   (d) $\int \ln(x)\,dx$

   (e) $\int x^5\ln(x)\,dx$

   (f) $\int e^x\cos x\,dx$

   (g) $\int x\ln(1+x)\,dx$ Hint: Make a substitution first, then try integration by parts.

3. Evaluate the definite integral $\int_0^3 x\sin(3-x)\,dx$.

4. Let $f(x)$ be a twice differentiable function with $f(1)=2$, $f(4)=7$, $f'(1)=5$ and $f'(4)=3$. Evaluate $\int_1^4 xf''(x)\,dx$

5. If $f(0)=g(0)=0$ and f'' and g'' are continuous, show that

$$\int_0^a f(x)g''(x)\,dx = f(a)g'(a) - f'(a)g(a) + \int_0^a f''(x)g(x)\,dx.$$