Integration by Parts

1. Evaluate the following indefinite integrals:

(a) $\displaystyle\int x\cos x\,dx$

(b) $\displaystyle\int -4xe^{4x}\,dx$

(c) $\displaystyle\int \ln x\,dx$

(d) $\displaystyle\int (x^4-2)\ln x\,dx$

(e) $\displaystyle\int e^x\cos(2x)\,dx$

(f) $\displaystyle\int x^3\sin x\,dx$

2. Evaluate the following definite integrals:

(a) $\displaystyle\int_{\frac{\pi}{4}}^{\frac{\pi}{3}} 4x\sec^2(3x)\,dx$

(b) $\displaystyle\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} 2x\sin x\,dx$

(c) $\displaystyle\int_{-\pi/2}^{\pi/2} e^{-x}\cos x\,dx$

(d) $\displaystyle\int_{-4}^{2} x^2e^{\frac{x}{2}}\,dx$

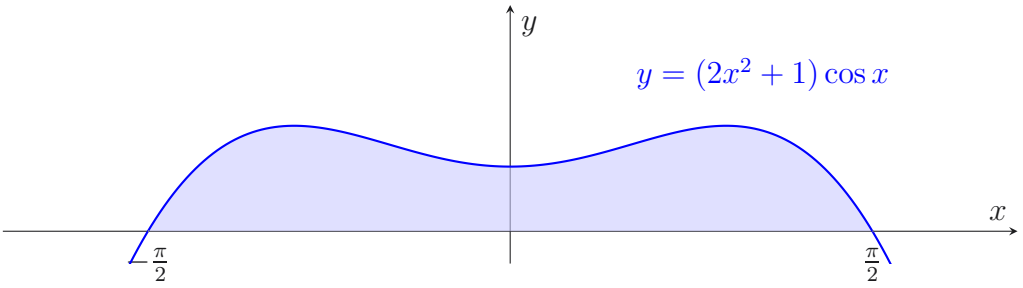
(e) $\displaystyle\int_{2}^{4} \ln(x^2-1)\,dx$

(f) $\displaystyle\int_{\frac{1}{2}}^{1} \frac{\ln x}{x^2}\,dx$

3. (a) Differentiate $\arctan x$, with respect to x.

(b) Hence find $\displaystyle\int \arctan x\,dx$.

4. Find the area bounded by the curve $y = (2x^2 + 1)\cos x$ and the lines $x = -\frac{\pi}{2}$ and $x = \frac{\pi}{2}$.



5. (a) Differentiate $\arcsin(2x)$.

(b) Hence evaluate $\displaystyle\int_{-1}^{1/2} 4x \arcsin(2x)\, dx$.

6. (a) Sketch the graph of the curve $y = \sqrt{x}\ln(2x)$, labelling all intersections with the axes.

(b) Find the area bounded by the curve and $x = 1$.