University of Bahrain
Department of Mathematics
MATHS122: Calculus II
Spring 2016
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Worksheet 3: Integration by parts and Trig Substitution

Students' Name: _____

Find the following integrals:

1. $\int (5x-2)e^x\,dx$.

2. $\int \sin^{-1} x\,dx$.

3. $\int \frac{\ln x}{\sqrt{x}}\, dx.$

4. $\int \cos\sqrt{x}\, dx.$
(Hint: Use substitution first)

5. $\int e^{2x} \cos x \, dx$.

6. Show that $\int (\ln x)^n \, dx = x(\ln x)^n - n \int (\ln x)^{n-1} \, dx$.

7. $\int \frac{\cos^5 x}{\sqrt{\sin x}}\, dx.$

8. Without using $\sin^2 x = \frac{1}{2}(1 - \cos 2x)$

   1. Use integration by parts to reduce $\int \sin^2 x \, dx$ into an integral involving $\int \cos^2 x \, dx$.

   2. Use $\cos^2 x = 1 - \sin^2 x$ to find $\int \sin^2 x \, dx$.

   3. Compare your answer with Exercise 3 in Section 8.0.

9. In this exercise, we would like to show that the volume we get from rotating a region around an axis is the same if we use either the cylindrical shells (Section 6.2) or cross–section method (Section 6.1). Consider a one–to–one function f such that $f(0) = 0$ and $f(b) = d$ with inverse $x = g(y)$. Assume that the region bounded by the function $f(x)$, $y = 0$, and $x = b$ is revolved around the y–axis.

   1. Find the volume of the generated solid using the cylindrical shell method.

   2. Find the volume of the generated solid using the cross–section method.

   3. Use integration by parts to convert the integral in (2) into the integral in (1) or vice versa.