University of Calgary Faculty of Science Department of Mathematics and Statistics

Math 251/249

Worksheet 14 [More Integration with applications]

1. Evaluate each of the following definite integrals:

a.
$$\int \frac{x}{\sqrt{x^2 + 1}} dx$$

b.
$$\int x \sqrt{x^2 + 1} \ dx$$

c.
$$\int \sin^2 \theta \ d\theta \ dx$$

d.
$$\int \frac{1}{x} (\ln x)^2 dx$$

2. Determine the area of the region enclosed by the curves given in each case.

a.
$$y = \sin \theta$$
; $x = \frac{\pi}{6}$; $x = \frac{\pi}{3}$; $y = 0$.

b.
$$y = \sin \theta$$
; $y = \cos \theta$; $x = 0$; $x = \frac{\pi}{2}$.

c.
$$y = x^2 - 4x$$
; $y = x$.

d.
$$y = x^2 - 4x$$
; $y = 6 - 3x^2$.

e.
$$y = e^x$$
; $y = e^{-x}$; $x = -1$; $x = 1$.

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f.
$$x = y$$
; $x = y^2 - 12$.

g.
$$x = y^2$$
; $x = 2y^2 - y + 3$.

h.
$$y = (x^2 - 1)^2$$
; $y = 1 - x^2$.

i.
$$y = \frac{4}{x^2}$$
; $y = 5 - x^2$.

j.
$$y = x^3 - 2x^2$$
; $y = 2x^2 - 3x$.