

## MATH 1710: Tutorial 11 (Trigonometric Substitutions and Completing Squares)

1. Evaluate the following indefinite integrals:

$$(i) \int \frac{1}{\sqrt{x^2 - 5}} dx, \quad (ii) \int x\sqrt{5x^2 + 3} dx, \quad (iii) \int \frac{x^2}{(2 - 9x^2)^{3/2}} dx,$$

$$(iv) \int \frac{x^2}{\sqrt{x^2 - 5}} dx.$$

2. Find the length of the portion of the parabola  $y = x^2$  from  $(0,0)$  to  $(1,1)$ .

3. The parabola  $x = y^2$  divides the circle  $x^2 + y^2 = 4$  into two parts. Find the second moment of area of the smaller part about the  $x$ -axis.

4. Evaluate the indefinite integrals:

$$(i) \int \frac{\sqrt{x^2 + 2x - 3}}{x + 1} dx, \quad (ii) \int \sqrt{-y^2 + 6y} dy, \quad \int \frac{2x - 3}{x^2 + 6x + 13} dx.$$

5. One of the gates in a dam is circular with radius 1 metre. If the gate is closed and the surface of the water is 3 metres above the top of the gate, find the force due to water pressure on the gate.