

(Problems taken from worksheet by Rob Bayer)

Trig Substitution

- (1) Consider the integral $\int \frac{x}{\sqrt{9-x^2}} dx$.
- (a) Find this integral using an appropriate trig substitution.
 - (b) Find this integral using an ordinary u-substitution.
 - (c) Are your answers the same?
- (2) Calculate:
- (a) $\int \frac{dx}{x^2\sqrt{16-x^2}}$.
 - (b) $\int \frac{\cos t}{\sqrt{1+\sin^2 t}} dt$.
- (3) True/False. For those that are true, prove it. For those that are false, give a counterexample.
- (a) $\sin^{-1}(\sin x) = x$ for all x .
 - (b) $\sqrt{\sec^2(x) - 1} = \tan x$.
 - (c) $\sin(\sin^{-1} x) = x$ for all x in the domain of \sin^{-1} .

Partial Fractions

- (1) Give the form of the partial fraction decomposition for each of the following. You need not solve for A, B, C , etc.
- (a) $\frac{x^3 + 2x - 1}{x^4 - 3x^3 - 4x^2}$.
 - (b) $\frac{3x^2 - 7x}{(x-2)^2(x^2 + x + 1)^2x^3}$.
 - (c) $\frac{x^3 - 1}{x^2 - x}$.
- (2) Consider the integral $\int \frac{dx}{x^2 - 4}$.
- (a) Find this integral using partial fractions.
 - (b) Find this integral using trig substitution.
 - (c) Are your answers the same?
- (3) Calculate the following:
- (a) $\int \frac{6x^3 + 7x^2 - 2x - 5}{x^4 - x^2} dx$.
 - (b) $\int \frac{3e^{2t}}{e^{2t} - e^t - 6} dt$.