

Warm-Up Problems and Lecture Problems
February 7, 2003

1. For each of the following integrals, determine the correct choice of trigonometric substitution. (Use the chart handed out last time.)

(a)

$$\int \frac{1}{x^2 \sqrt{x^2 - 25}} dx$$

(b)

$$\int \frac{1}{(25 + 16x^2)^{3/2}} dx$$

(c)

$$\int \frac{\sqrt{5 - x^2}}{x} dx$$

2. For the substitutions made in the previous problem, convert the following expressions into expressions of x . For example, if your substitution was $x = \sin \theta$ and you are asked to put $\sin^2 \theta$ into an expression of x , you would write $\sin^2 \theta = x^2$.

Remember to draw the appropriate triangle!

(a) $\theta + \cos \theta - \tan \theta$

(b) $\theta + \cos \theta - \tan \theta$

(c) $\theta + \cos \theta - \tan \theta$

3. Write the following fractions in the correct “partial fraction decomposition form:”

(a)

$$\frac{x^2 + 3x}{(x^2 + x + 1)(x - 2)}$$

(b)

$$\frac{5x^3 - 1}{(2x + 3)^3(x + 4)}$$

4. Solve for the constants in the following partial fraction decomposition:

$$\frac{5}{(2x+1)(x-2)} = \frac{A}{2x+1} + \frac{B}{x-2}$$

5. Here is an integral that I have done the partial fraction decomposition. Do the rest of the work and compute the antiderivative. (You might want to perform the partial fraction decomposition at home later.)

$$\int \frac{5x^3 - 3x^2 + 2x - 1}{x^4 + x^2} dx = \int \left(\frac{2}{x} - \frac{1}{x^2} + \frac{3x - 2}{x^2 + 1} \right) dx$$