

Math 1B Group Work Problems

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You should work on the following problems in groups of 3 or 4. Try to get through as many as you can, but you aren't expected to finish everything. Instead, you should make sure everyone in your group knows **how** to solve all the problems, and not just the answers.

Simple Rational Functions

1. Find each of the following:

(a) $\int \frac{dx}{(x-3)^3}$

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

(c) $\int \frac{x^5+3x^2-2}{x-1} dx$

2. Use the fact that $\frac{1}{x^2-1} = \frac{1}{2} \left(\frac{1}{x-1} - \frac{1}{x+1} \right)$ to find $\int \frac{dx}{x^2-1}$

Partial Fractions

1. Give the form of the partial fraction decomposition you would use to integrate each of the following. You need not actually compute A, B, C, etc:

(a) $\int \frac{x}{(x+1)(x+2)(x+3)}$

(b) $\int \frac{x^2-4x+2}{x(x+3)^3(x-2)}$

(c) $\int \frac{3x+7}{x^4+6x^3+9x^2}$

(d) $\int \frac{1}{x^5+x^3}$

2. Find $\int \frac{x^4+1}{x(x^2+1)^2} dx$

3. Find $\int \ln(x^2-x+2) dx$

Extra Problems (if you finish either section early, take a stab at these)

1. Find $\int \tan^4 x dx$

2. Find $\int x\sqrt{x^4+1} dx$

3. Prove the formula $A = \frac{1}{2}r^2\theta$ for the area of a sector of circle with radius r of θ radians. Hint: the area is the sum of the area of the triangle POQ and the the region PQR. By using trig, you can find the lengths of the line segments OQ and QP.