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Computer Science 355  
Modern Computer Algebra

# Assignment 7

**Due date:** Dec. 08

**Objective:** Algorithms of Integration

*write your name here*

## Problem 1

Implement Rothstein-Trager's algorithm for a rational function assuming that the denominator is squarefree.

```
Trager[expr_, x_] :=
```

For example,

$$\text{Trager} \left[ \frac{(43 x^9 + 48 x^8 - 116 x^7 - 126 x^6 - 11 x^3 - 26 x^2 - 23 x - 8)}{(15 (x + 1) (x^2 - 2) (x^7 + x + 1))}, x \right]$$
$$-\frac{1}{3} \text{Log}[1 + x] - \frac{1}{2} \text{Log}\left[-1 + \frac{x^2}{2}\right] + \frac{3}{5} \text{Log}[1 + x + x^7]$$

## Problem 2

*Implement Rothstein-Trager's algorithm in a logarithmic extension*

```
TragerLog[expr_, x_] :=
```

*For example,*

$$\text{TragerLog}\left[\frac{\text{Log}[x] - x^2}{x (\text{Log}[x]^2 - x^2)}, x\right]$$

$$\frac{1}{2} \text{Log}\left[-x^2 + \text{Log}[x]^2\right]$$

**Problem 3**

*Evaluate the integral*

$$\int \frac{e^{2x^2} x + 8\sqrt{2} (1 + e^{x^2}) x + 2}{2 + 2e^{x^2} + e^{2x^2} + e^{3x^2}} dx$$

*in elementary functions. Demonstrate each step of the algorithm.*