

Test 1

Math 141 Calculus II, UMass Boston, Fall 2014

Instructor: Todor Milev

Time for work: 55 minutes.

Name:

The exam is closed books/notes, no calculators allowed. You are allowed a single one-sided formula sheet, handwritten by you. The formula sheet will be collected together with the test.

Problem 1.

Express as a rational function of t .

$\cot(2 \arctan t)$

$\frac{1-t^2}{2t}$

Problem 2.

Evaluate the indefinite integral. Illustrate the steps of our solution.

$\int x e^{-2x} \mathrm{d} x$

$\frac{1}{2} e^{-2x} - \frac{x}{2} e^{-2x} + C$

Problem	1	2	3	4	5	6	Σ
Points	16	16	16	16	16	25	105
Score							

Problem 3. Integrate

$$\int \frac{x}{3x^2 + x - 2} dx$$

answer: $\frac{9}{4} \ln \left| x^2 + \frac{3}{2}x + \frac{3}{4} \right| - \frac{69}{\sqrt{23}} \arctan \frac{\sqrt{23}x + \frac{3\sqrt{23}}{9}}{\sqrt{23}}$ + C

Problem 4. Integrate

$$\int \frac{x}{3x^2 + x + 2} dx$$

answer: $\frac{9}{4} \ln \left(x^2 + \frac{3}{2}x + \frac{3}{4} \right) - \frac{69}{\sqrt{23}} \arctan \frac{\sqrt{23}x + \frac{3\sqrt{23}}{9}}{\sqrt{23}}$ + C

Problem 5. *Integrate*

$$\int \frac{1}{4 + \cos x} \mathrm{d}x$$

answer: $\frac{1}{2} \sqrt{15} \arctan \left(\frac{5}{\sqrt{15} x} \right) + C$

Problem 6. *Integrate*

$$\int \sqrt{3x^2 + x + 1} dx$$

$$C + \left(1 + \frac{\sqrt{3}}{2} \left(\frac{2}{3} + x \right) \right) \sqrt{\frac{2}{3} + x} + \left(\left(\frac{2}{3} + x \right) \sqrt{\frac{2}{3} + x} + \frac{1}{2} \left(\frac{2}{3} + x \right) \right) \ln \left| \frac{\sqrt{\frac{2}{3} + x} + 1}{\sqrt{\frac{2}{3} + x} - 1} \right| + C$$