

## Math 230: Applied Calculus II Matlab Assignment #2A

Due Monday Week #7 (12/12/05)

**Title:** Polynomials & Partial Fractions

**Objectives:** To review numerical integration techniques,

To learn to find roots of polynomials, and

To use Matlab to compute a partial fraction decomposition.

**Instructions:**

(1) Use midpoints to approximate the integral  $\int_3^{10} \frac{4}{x^3-10x+4} dx$  using 10 and then 1000 intervals.

(2) Use the **roots** function to determine the roots of  $p(x) = x^3 - 10x + 4$ .

(3) Use the **residue** function to find the partial fraction decomposition of  $\frac{4}{x^3-10x+4}$  as  $\frac{A}{x-a} + \frac{B}{x-b} + \frac{C}{x-c}$ .

(4) Use the partial fraction decomposition to evaluate the integral “exactly” using the formula<sup>1</sup>

$$\int_3^{10} \frac{4}{x^3 - 10x + 4} dx = \int_3^{10} \frac{A}{x - a} + \frac{B}{x - b} + \frac{C}{x - c} dx = A \ln \left| \frac{10 - a}{3 - a} \right| + B \ln \left| \frac{10 - b}{3 - b} \right| + C \ln \left| \frac{10 - c}{3 - c} \right|.$$

(5) Try to use the same *exact* method to evaluate the integral  $\int_0^2 \frac{1}{2+x^3} dx$ .

(6) Supply your answer in two parts with your commands listed in a *script m-file* followed by a *print-out* of the corresponding output. Alternatively, you can *electronically submit* an m-file to the eCollege Dropbox.

Sample code to analyze  $\frac{5x^2-24x-12}{x^3-4x}$ , decompose it using partial fractions, and approximate the integral  $\int_3^5 \frac{5x^2-24x-12}{x^3-4x} dx = \ln \left( \frac{77}{3^8 5^4} \right)$ .

```

clc
format compact
format long g
% Integrating
p = [5 -24 -12]
q = [1 0 -4 0]
rp = roots(p)
rq = roots(q)
[R,P,K] = residue(p,q)
a=3, b=5
n1=10, n2=1000
dx1=(b-a)/n1
dx2=(b-a)/n2
x1=[a+dx1/2:dx1:b]
x2=[a+dx2/2:dx2:b]
y1=polyval(p,x1)./polyval(q,x1);
y2=polyval(p,x2)./polyval(q,x2);
sum1 = sum(y1)*dx1
sum2 = sum(y2)*dx2
exact = log(7^7/(3^8*5^4))

```

<sup>1</sup>Compare your result against the value computed by **Maple** which is 0.7704900269359136

## Math 230: Applied Calculus II Matlab Assignment #2B

Due Monday Week #7 (12/12/05)

**Title:** Polynomials & Partial Fractions

**Objectives:** To review numerical integration techniques,

To learn to find roots of polynomials, and

To use Matlab to compute a partial fraction decomposition.

**Instructions:**

(1) Use midpoints to approximate the integral  $\int_3^{10} \frac{6}{x^3-10x+6} dx$  using 10 and then 1000 intervals.

(2) Use the **roots** function to determine the roots of  $p(x) = x^3 - 10x + 6$ .

(3) Use the **residue** function to find the partial fraction decomposition of  $\frac{6}{x^3-10x+6}$  as  $\frac{A}{x-a} + \frac{B}{x-b} + \frac{C}{x-c}$ .

(4) Use the partial fraction decomposition to evaluate the integral “exactly” using the formula<sup>2</sup>

$$\int_3^{10} \frac{6}{x^3 - 10x + 6} dx = \int_3^{10} \frac{A}{x - a} + \frac{B}{x - b} + \frac{C}{x - c} dx = A \ln \left| \frac{10 - a}{3 - a} \right| + B \ln \left| \frac{10 - b}{3 - b} \right| + C \ln \left| \frac{10 - c}{3 - c} \right|.$$

(5) Try to use the same *exact* method to evaluate the integral  $\int_0^4 \frac{1}{4+x^3} dx$ .

(6) Supply your answer in two parts with your commands listed in a *script m-file* followed by a *print-out* of the corresponding output. Alternatively, you can *electronically submit* an m-file to the eCollege Dropbox.

Sample code to analyze  $\frac{5x^2-24x-12}{x^3-4x}$ , decompose it using partial fractions, and approximate the integral

$$\int_3^5 \frac{5x^2-24x-12}{x^3-4x} dx = \ln \left( \frac{7^7}{3^8 5^4} \right).$$

```

clc
format compact
format long g
% Integrating
p = [5 -24 -12]
q = [1 0 -4 0]
rp = roots(p)
rq = roots(q)
[R,P,K] = residue(p,q)
a=3, b=5
n1=10, n2=1000
dx1=(b-a)/n1
dx2=(b-a)/n2
x1=[a+dx1/2:dx1:b]
x2=[a+dx2/2:dx2:b]
y1=polyval(p,x1)./polyval(q,x1);
y2=polyval(p,x2)./polyval(q,x2);
sum1 = sum(y1)*dx1
sum2 = sum(y2)*dx2
exact = log(7^7/(3^8*5^4))

```

<sup>2</sup>Compare your result against the value computed by **Maple** which is 0.8332882129887516

## Math 230: Applied Calculus II Matlab Assignment #2C

Due Monday Week #7 (12/12/05)

**Title:** Polynomials & Partial Fractions

**Objectives:** To review numerical integration techniques,

To learn to find roots of polynomials, and

To use Matlab to compute a partial fraction decomposition.

**Instructions:**

(1) Use midpoints to approximate the integral  $\int_3^{10} \frac{8}{x^3-10x+8} dx$  using 10 and then 1000 intervals.

(2) Use the **roots** function to determine the roots of  $p(x) = x^3 - 10x + 8$ .

(3) Use the **residue** function to find the partial fraction decomposition of  $\frac{8}{x^3-10x+8}$  as  $\frac{A}{x-a} + \frac{B}{x-b} + \frac{C}{x-c}$ .

(4) Use the partial fraction decomposition to evaluate the integral “exactly” using the formula<sup>3</sup>

$$\int_3^{10} \frac{8}{x^3 - 10x + 8} dx = \int_3^{10} \frac{A}{x - a} + \frac{B}{x - b} + \frac{C}{x - c} dx = A \ln \left| \frac{10 - a}{3 - a} \right| + B \ln \left| \frac{10 - b}{3 - b} \right| + C \ln \left| \frac{10 - c}{3 - c} \right|.$$

(5) Try to use the same *exact* method to evaluate the integral  $\int_0^5 \frac{1}{5+x^3} dx$ .

(6) Supply your answer in two parts with your commands listed in a *script m-file* followed by a *print-out* of the corresponding output. Alternatively, you can *electronically submit* an m-file to the eCollege Dropbox.

Sample code to analyze  $\frac{5x^2-24x-12}{x^3-4x}$ , decompose it using partial fractions, and approximate the integral

$$\int_3^5 \frac{5x^2-24x-12}{x^3-4x} dx = \ln \left( \frac{7^7}{3^8 5^4} \right).$$

```

clc
format compact
format long g
% Integrating
p = [5 -24 -12]
q = [1 0 -4 0]
rp = roots(p)
rq = roots(q)
[R,P,K] = residue(p,q)
a=3, b=5
n1=10, n2=1000
dx1=(b-a)/n1
dx2=(b-a)/n2
x1=[a+dx1/2:dx1:b]
x2=[a+dx2/2:dx2:b]
y1=polyval(p,x1)./polyval(q,x1);
y2=polyval(p,x2)./polyval(q,x2);
sum1 = sum(y1)*dx1
sum2 = sum(y2)*dx2
exact = log(7^7/(3^8*5^4))

```

<sup>3</sup>Compare your result against the value computed by **Maple** which is 0.9316766965059886

## Math 230: Applied Calculus II Matlab Assignment #2D

Due Monday Week #7 (12/12/05)

**Title:** Polynomials & Partial Fractions

**Objectives:** To review numerical integration techniques,

To learn to find roots of polynomials, and

To use Matlab to compute a partial fraction decomposition.

**Instructions:**

- (1) Use midpoints to approximate the integral  $\int_3^{10} \frac{10}{x^3-10x+10} dx$  using 10 and then 1000 intervals.
- (2) Use the **roots** function to determine the roots of  $p(x) = x^3 - 10x + 10$ .
- (3) Use the **residue** function to find the partial fraction decomposition of  $\frac{10}{x^3-10x+10}$  as  $\frac{A}{x-a} + \frac{B}{x-b} + \frac{C}{x-c}$ .
- (4) Use the partial fraction decomposition to evaluate the integral “exactly” using the formula<sup>4</sup>

$$\int_3^{10} \frac{10}{x^3 - 10x + 10} dx = \int_3^{10} \frac{A}{x-a} + \frac{B}{x-b} + \frac{C}{x-c} dx = A \ln \left| \frac{10-a}{3-a} \right| + B \ln \left| \frac{10-b}{3-b} \right| + C \ln \left| \frac{10-c}{3-c} \right|.$$

- (5) Try to use the same *exact* method to evaluate the integral  $\int_0^7 \frac{1}{7+x^3} dx$ .
- (6) Supply your answer in two parts with your commands listed in a *script m-file* followed by a *print-out* of the corresponding output. Alternatively, you can *electronically submit* an m-file to the eCollege Dropbox.

Sample code to analyze  $\frac{5x^2-24x-12}{x^3-4x}$ , decompose it using partial fractions, and approximate the integral

$$\int_3^5 \frac{5x^2-24x-12}{x^3-4x} dx = \ln \left( \frac{7^7}{3^8 5^4} \right).$$

```

clc
format compact
format long g
% Integrating
p = [5 -24 -12]
q = [1 0 -4 0]
rp = roots(p)
rq = roots(q)
[R,P,K] = residue(p,q)
a=3, b=5
n1=10, n2=1000
dx1=(b-a)/n1
dx2=(b-a)/n2
x1=[a+dx1/2:dx1:b]
x2=[a+dx2/2:dx2:b]
y1=polyval(p,x1)./polyval(q,x1);
y2=polyval(p,x2)./polyval(q,x2);
sum1 = sum(y1)*dx1
sum2 = sum(y2)*dx2
exact = log(7^7/(3^8*5^4))

```

<sup>4</sup>Compare your result against the value computed by **Maple** which is 1.0276456538900532

## Math 230: Applied Calculus II Matlab Assignment #2E

Due Monday Week #7 (12/12/05)

**Title:** Polynomials & Partial Fractions

**Objectives:** To review numerical integration techniques,

To learn to find roots of polynomials, and

To use Matlab to compute a partial fraction decomposition.

**Instructions:**

(1) Use midpoints to approximate the integral  $\int_3^{10} \frac{12}{x^3-10x+12} dx$  using 10 and then 1000 intervals.

(2) Use the **roots** function to determine the roots of  $p(x) = x^3 - 10x + 12$ .

(3) Use the **residue** function to find the partial fraction decomposition of  $\frac{12}{x^3-10x+12}$  as  $\frac{A}{x-a} + \frac{B}{x-b} + \frac{C}{x-c}$ .

(4) Use the partial fraction decomposition to evaluate the integral “exactly” using the formula<sup>5</sup>

$$\int_3^{10} \frac{12}{x^3 - 10x + 12} dx = \int_3^{10} \frac{A}{x-a} + \frac{B}{x-b} + \frac{C}{x-c} dx = A \ln \left| \frac{10-a}{3-a} \right| + B \ln \left| \frac{10-b}{3-b} \right| + C \ln \left| \frac{10-c}{3-c} \right|.$$

(5) Try to use the same *exact* method to evaluate the integral  $\int_0^9 \frac{1}{9+x^3} dx$ .

(6) Supply your answer in two parts with your commands listed in a *script m-file* followed by a *print-out* of the corresponding output. Alternatively, you can *electronically submit* an m-file to the eCollege Dropbox.

Sample code to analyze  $\frac{5x^2-24x-12}{x^3-4x}$ , decompose it using partial fractions, and approximate the integral

$$\int_3^5 \frac{5x^2-24x-12}{x^3-4x} dx = \ln \left( \frac{7^7}{3^8 5^4} \right).$$

```

clc
format compact
format long g
% Integrating
p = [5 -24 -12]
q = [1 0 -4 0]
rp = roots(p)
rq = roots(q)
[R,P,K] = residue(p,q)
a=3, b=5
n1=10, n2=1000
dx1=(b-a)/n1
dx2=(b-a)/n2
x1=[a+dx1/2:dx1:b]
x2=[a+dx2/2:dx2:b]
y1=polyval(p,x1)./polyval(q,x1);
y2=polyval(p,x2)./polyval(q,x2);
sum1 = sum(y1)*dx1
sum2 = sum(y2)*dx2
exact = log(7^7/(3^8*5^4))

```

<sup>5</sup>Compare your result against the value computed by **Maple** which is 1.1176312253221525