
HW 11

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2c)

```
fun = @(y, t) (y^2 + y)/t;  
[w, t] = AdamsAdaptPC(fun, [1 3], -2, 10^-4, [.01 .4]);
```

2a)

```
clear;  
%y1 = y(1) - y(2) + 2;  
%y2 = -y(1) + y(2) +4*t;  
  
u1 = @(t) -0.5*exp(2*t) + t.^2 + 2*t - 0.5;  
u2 = @(t) 0.5*exp(2*t) + t.^2 - 0.5;  
exact = [u1(0:0.1:1); u2(0:0.1:1)]  
[w, t] = rk4_systems(0, 1, 10, [-1; 0])  
diff = abs(w - exact)
```

exact =

Columns 1 through 7

-1.0000	-0.9007	-0.8059	-0.7211	-0.6528	-0.6091	-0.6001
0	0.1207	0.2859	0.5011	0.7728	1.1091	1.5201

Columns 8 through 11

-0.6376	-0.7365	-0.9148	-1.1945
2.0176	2.6165	3.3348	4.1945

w =

Columns 1 through 7

-1.0000	-0.9007	-0.8059	-0.7211	-0.6528	-0.6091	-0.6000
0	0.1207	0.2859	0.5011	0.7728	1.1091	1.5200

Columns 8 through 11

```

-0.6376  -0.7365  -0.9148  -1.1944
 2.0176   2.6165   3.3348   4.1944

```

```
t =
```

```
Columns 1 through 7
```

```

0    0.1000    0.2000    0.3000    0.4000    0.5000    0.6000

```

```
Columns 8 through 11
```

```

0.7000    0.8000    0.9000    1.0000

```

```
diff =
```

```
1.0e-04 *
```

```
Columns 1 through 7
```

```

0    0.0138    0.0337    0.0617    0.1005    0.1535    0.2249
0    0.0138    0.0337    0.0617    0.1005    0.1535    0.2249

```

```
Columns 8 through 11
```

```

0.3205    0.4474    0.6148    0.8343
0.3205    0.4474    0.6148    0.8343

```

4a)

```

clear;
%y''-3y'+2y = 6e^(-t)
% x1 = x(2);
% x2 = 6*exp(-t) + 3*x(2) - 2*x(1);
r = @(t) 2*exp(2*t) - exp(t) + exp(-t);
exact = r(0:0.1:1)
[w, t] = rk4_systems2(0, 1, 10, [2; 2])
diff = abs(w(1) - exact)

```

```
exact =
```

```
Columns 1 through 7
```

```

2.0000    2.2425    2.5810    3.0352    3.6296    4.3944    5.3669

```

```
Columns 8 through 11
```

```

6.5932    8.1299    10.0463    12.4277

```

w =

Columns 1 through 7

2.0000	2.2425	2.5810	3.0352	3.6295	4.3943	5.3669
2.0000	2.8756	3.9271	5.1978	6.7400	8.6178	10.9094

Columns 8 through 11

6.5931	8.1297	10.0460	12.4274
13.7102	17.1370	21.3320	26.4695

t =

Columns 1 through 7

0	0.1000	0.2000	0.3000	0.4000	0.5000	0.6000
---	--------	--------	--------	--------	--------	--------

Columns 8 through 11

0.7000	0.8000	0.9000	1.0000
--------	--------	--------	--------

diff =

Columns 1 through 7

0	0.2425	0.5810	1.0352	1.6296	2.3944	3.3669
---	--------	--------	--------	--------	--------	--------

Columns 8 through 11

4.5932	6.1299	8.0463	10.4277
--------	--------	--------	---------

6a)

```
clear;
u1 = @(t) -0.5*exp(2*t) + t.^2 + 2*t - 0.5;
u2 = @(t) 0.5*exp(2*t) + t.^2 - 0.5;
exact = [u1(0:0.1:1); u2(0:0.1:1)]
[w, t] = AdamsAdaptPC_systems(0, 1, 10, [-1; 0])
diff = abs(w - exact)
```

exact =

Columns 1 through 7

-1.0000	-0.9007	-0.8059	-0.7211	-0.6528	-0.6091	-0.6001
0	0.1207	0.2859	0.5011	0.7728	1.1091	1.5201

Columns 8 through 11

-0.6376	-0.7365	-0.9148	-1.1945
2.0176	2.6165	3.3348	4.1945

w =

Columns 1 through 7

-1.0000	-0.9007	-0.8059	-0.7211	-0.6528	-0.6091	-0.6000
0	0.1207	0.2859	0.5011	0.7728	1.1091	1.5200

Columns 8 through 11

-0.6376	-0.7365	-0.9148	-1.1944
2.0176	2.6165	3.3348	4.1944

t =

Columns 1 through 7

0	0.1000	0.2000	0.3000	0.4000	0.5000	0.6000
---	--------	--------	--------	--------	--------	--------

Columns 8 through 11

0.7000	0.8000	0.9000	1.0000
--------	--------	--------	--------

diff =

1.0e-04 *

Columns 1 through 7

0	0.0138	0.0337	0.0617	0.1005	0.1535	0.2249
0	0.0138	0.0337	0.0617	0.1005	0.1535	0.2249

Columns 8 through 11

0.3205	0.4474	0.6148	0.8343
0.3205	0.4474	0.6148	0.8343

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