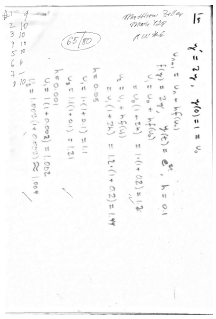
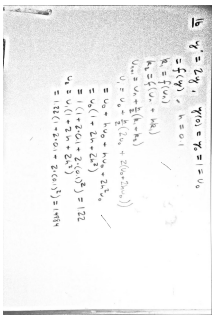
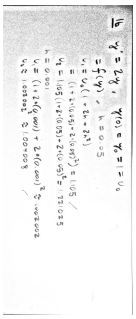


12/5/18 11:22 AM C:\Users\Matt\D...\oneStepEuler.m 1 of 1

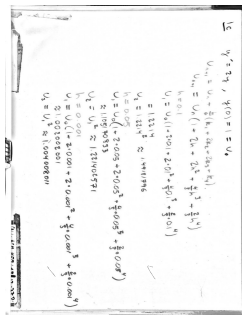
```
%OneStepEuler
%Matt Zeller
%PHYS 428
%12/3/2018

h=0.001;
n=1/h
un=zeros(n,1);
j=1;
un(1,1)=1
for i=0:h:1
    un(j+1,1)=un(j,1)+(-2*i-2*i^2+1)*h;
    j=j+1;
end
format long
un(n+1,1)
```





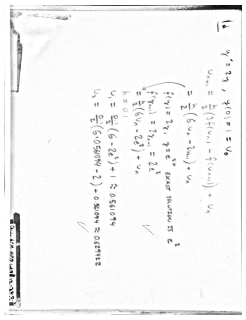
12/5/18 11:27 AM C:\Users\M...\oneStepModEuler.m 1 of 1

```
%OneStepModEuler
%Matt Zeller
%PHYS 428
%12/3/2018

h=0.01;
n=1/h
un=zeros(n,1);
j=1;
un(1,1)=1
for i=0:h:1
    un(j+1,1)=un(j,1)*(1+2*i+2*i^2);
    j=j+1;
end
format long
un(n+1,1)
```



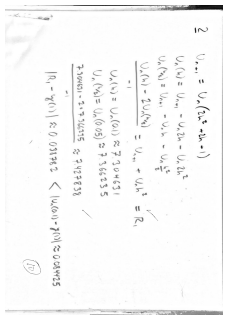
12/5/18 11:28 AM C:\U...\oneStepRungeOrderFour.m 1 of 1

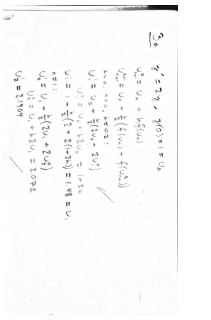
```
%OneStepRungeOrderFour
%Matt Zeller
%PHYS 428
%12/3/2018

h=0.001;
n=1/h
un=zeros(n,1);
j=1;
un(1,1)=1
for i=0:h:1
    un(j+1,1)=un(j,1)*(1+2*i+2*i^2+2*i^3+(2/3)*i^4);
    j=j+1;
end
format long
un(n+1,1)
```

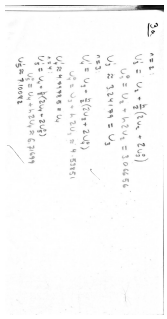


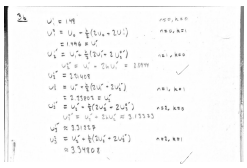
12/5/18 11:28 AM C:\Us...\oneStepAdamBashforth.m 1 of 1

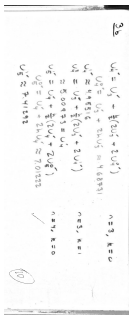
```
%OneStepAdamBashforth
%Matt Zeller
%PHYS 428
%12/3/2018

h=0.001;
n=1/h
un=zeros(n,1);
j=1;
un(1,1)=exp(2);
un(2,1)=1;
for i=0:h:1
    un(j+2,1)=(h/2)*(6*un(j+1,1)-2*un(j,1)) + un(j+1,1);
    j=j+1;
end
format long
un(n+1,1)
```

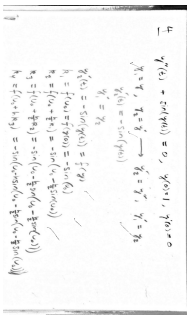


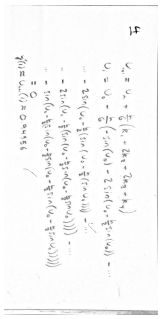


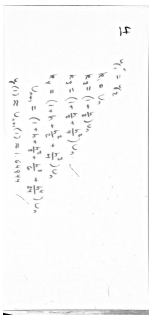










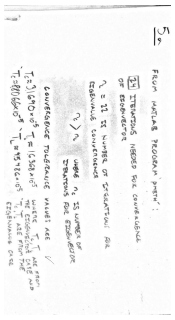


12/5/18 6:18 PM C:\Users\Matt\Documents\G...\v2.m 1 of 1

```
%p2
%Matt Zeller
%PHYS 428
%12/5/2018

%u2 is solution to y'(t), v2 is solution to y(t)
syms t y(t) u(t) v(t)
format long
u2=u1+(0.5/6)*[  v(sin(t)  )  +2*(  sin(u1 - 2*(  sin(u1 - 2*(  sin(u1 - 2*(  sin(u1 - 2*(  v(
sin(u1 - 2*(sin(u1)))  ))  )  +  (sin(u1 - 2*(  sin(u1 - 2*(sin(u1 - 2*(sin(u1))))))  )
v2=v1+(0.5/4)*(0.5*4)/24+(0.5^3)/6+(0.5^2)/2+0.5+1)
end
```

MATLAB Command Window — Page 1
December 5, 2018 — 6:18:57 PM

```
>> u2(1,1)

u2 =

    0.94955937665508411

u2 =

    1.64843750000000000
```



12/5/18 12:56 PM C:\Users\Matt\Docume...\pmeth.m 1 of 2

```
%pmeth
%Matt Zeller
%12/3/2018
%PHYS 428
%This program finds eigenvector and dominant eigenvalue of matrix A
%u2 is the leading eigenvector, v1 follows, and so on
%totVec is convergence tolerance for the vector, totVal= the value
%c2 is leading 'convergence' as defined on page 200 of A Friendly
Introduction to
%Numerical Analysis--it is "an estimate for the asymptotic rate of linear
convergence" of the sequence towards the dominant eigenvalue
%c1 follows c2
A = [1 4 5; 4 -3 0; 5 0 7];
v00 = ones(3,1);
v0 = ones(3,1);
v1 = ones(3,1);
v2 = ones(3,1);
v1 = (1/sqrt(3))*v1;
totVec = 1;
totVal = 1;
n = 6;
format long
%change totVec to totVal to evaluate convergence of the eigenvalue
while totVec> 5*10^-5
    n=n+1;
    v2 = A*v1;
    c2 = (v2(3,1) +v1(3,1))/(v1(3,1) +v0(3,1));
    c1 = (v1(3,1) +v0(3,1))/(v0(3,1) +v00(3,1));
    totVec = abs(c2-c1);
    totVal = abs(v2(3,1)/v1(3,1)-(v0(3,1)/v00(3,1)));
    v00 = v0;
    v0 = v1;
    v1 = v2;
end
domEig = v2(3,1)/v1(3,1)
n
```

12/5/18 12:56 PM C:\Users\Matt\Docume...\pmeth.m 2 of 2

```
totVec
totVal
v2
```

MATLAB Command Window — Page 1
November 26, 2018 — 7:53:27 PM

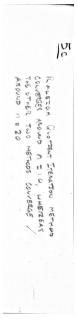
```
domEig =

     1


n =

    24


totVec =

   3.169316606109899e-05


totVal =

   1.636784771186228e-05


v2 =

  1.0e+24 *

   0.662237994690559
   0.201428976555814
   1.050874143638659
```

12/5/18 12:59 PM C:\Users\Mat...\inversepmethod.m 1 of 1

```
%inversepmethod
%Matt Zeller
%12/3/2018
%PHYS 428

%This program finds dominant eigenvalue of matrix A using
%inverse power method
A = [1 4 5; 4 -3 0; 5 0 7];
Ainv = inv(A);
v1 = (1/sqrt(3))*ones(3,1);
v2 = ones(3,1);
format long
disp(['n' ,'  Estimate at n' ,'   ' ,'Reciprocal'])
disp(' ')
    for n = 1:10
        v2 = Ainv*v1;
        en = norm(v2,inf);
        disp([num2str(n),'   ',num2str(en),'                ',num2str(1/en)])
        v2 = v2 / norm(v2,inf);
        v1 = v2;
    end

disp(' ')
disp(' ')
disp(['The approximate eigenvalue of A nearest to q=1 is ',num2str(1/en),])
```

MATLAB Command Window — Page 1
November 26, 2018 — 11:23:33 PM

```
n   Estimate at n    Reciprocal

1   0.33845              2.9547
2   0.88235              1.1333
3   1.0414               0.96026
4   1.0684               0.93595
5   1.0652               0.9388
6   1.0658               0.93828
7   1.0657               0.93835
8   1.0657               0.93834
9   1.0657               0.93834
10   1.0657              0.93834

The approximate eigenvalue of A nearest to q=1 is 0.93834
```



12/5/18 1:01 PM C:\Users\Matt\Docume...\raleigh.m 1 of 1

```
%inversepmethod
%Matt Zeller
%12/3/2018
%PHYS 428

%This program finds dominant eigenvalue of matrix A using
%Rayleigh Quotient
A = [1 4 5; 4 -3 0; 5 0 7];
v1 = (1/sqrt(3))*ones(3,1);
v2 = ones(3,1);
S = v1'*A*v1'*v1;
An = A-eye(3)*S;

disp(['n' ,'  Estimate at n' ,'                ' ,'Reciprocal'])
disp(' ')
format long
    for n = 1:20
        v2 = An*v1;
        en = norm(v2,inf);
        disp([num2str(n),'   ',num2str(en,'%1.10e'),'          ',num2str(1/en,'%1.10e')])
        v2 = v2 / norm(v2,inf);
        v1 = v2;
    end

disp(' ')
disp(' ')
disp(['The approximate dominant eigenvalue of A is ',num2str(1/en),])
disp(['The associated eigenvector is :'])
disp(' ')
disp(v2)
```

MATLAB Command Window — Page 1
November 27, 2018 — 12:45:03 PM

```
>> raleigh

S =

   4.426352063787133
   4.426352063787133
   4.426352063787133

n   Estimate at n              Reciprocal

 1   7.089316397e+00          1.410573240e-01
 2   8.001281054e+00          1.249798672e-01
 3   9.710272482e+00          1.029837234e-01
 4   8.845156096?e+00         1.130562977e-01
 5   8.240619962e+00          1.082179473e-01
 6   9.050397412e+00          1.104923853e-01
 7   9.189721800?e+00         1.084125063e-01
 8   9.080727596564e+00       1.099230147?e-01
 9   9.117327219?9e+00        1.096812668?e-01
10   9.107826266?7e+00        1.097956239?e-01
11   9.112328799?6e+00        1.097475217?e-01
12   9.110192631?9e+00        1.097677630?e-01
13   9.111199750?e+00         1.097530297?e-01
14   9.110722972?0e+00        1.097607734?e-01
15   9.110948624?7e+00        1.097585467?e-01
16   9.110841180?2e+00        1.097594181?e-01
17   9.110892364?e+00         1.097587327?e-01
18   9.110868432?1e+00        1.097590210?e-01
19   9.110879759?6e+00        1.097588465?e-01
20   9.110874397?e+00         1.097589491?e-01


The approximate dominant eigenvalue of A is 0.10976
The associated eigenvector is
```

MATLAB Command Window — Page 2
November 27, 2018 — 12:45:03 PM

```
0.036856950753800
1.000000000000000
0.377007561885549
```