

MATH 241 (Laskowski) Fall, 2007
 MATLAB Problem Set 1
Due Thursday, October 4

Print out the plots of each part of the following problems to hand in. If you wish to economize on the amount of paper, you may use the command `subplot`.

Even though the first four problems can be done on the command line, it is useful to put all the commands in an Mfile, which can then be published.

1. Graph the function

$$f(x) = \frac{\cos x}{1 + x^2}$$

on the interval $[0, 2\pi]$.

(a) Use the commands

```
>> x = linspace(0, 2*pi, 11);
>> f =@(x) cos(x)./(1+x.^2);
>> plot(x,f(x))
```

The result should be a polygonal line through the 11 points $(x_j, f(x_j))$, where $x_j = (2\pi j)/10$, $j = 0, 1, \dots, 10$.

(b) To make a smoother curve, increase the number of points.

```
>> x = linspace(0, 2*pi, 21);
>> plot(x,f(x))
>> x = linspace(0, 2*pi, 101);
>> plot(x,f(x))
```

2. Draw the circle with center at $(1, 2)$ and radius $r = 3/2$ with commands

```
>> t = linspace(0, 2*pi, 101);
>> x = 1+1.5*cos(t);
>> y = 2+1.5*sin(t);
>> plot(x,y)
```

3. Use the ideas in (2) and the command `plot3(x,y,z)` to graph the vector-valued function

$$\mathbf{F}(t) = \cos(t) \mathbf{i} + \sin(t) \mathbf{j} + t \mathbf{k}$$

Make your plot ‘reasonably smooth.’

4. Let C be the curve parametrized by $\mathbf{r}(t) = t\mathbf{i} + t^2/2\mathbf{j} + t^3/3\mathbf{k}$ for $0 \leq t \leq 2$.

(a) Approximate the length of C by polygonal approximation:

```
>> t = 0:0.02:2;
x = t; y=t.^2/2; z=t.^3/3;
sum=0;
for j=1:100
    dx=x(j+1)-x(j);
    dy=y(j+1)-y(j);
    dz=z(j+1)-z(j);
    dr=[dx,dy,dz];
    sum=sum+norm(dr);
end;
disp('Length of polygonal approx using 100 segments')
sum
```

(b) Next we use the numerical integration routine `quadl`. Note that $Speed(t) = \sqrt{1 + t^2 + t^4}$, so the formula for arc length gives an ‘impossible’ integral.

```
>> speed=@(t) sqrt(1+t.^2+t.^4);
>> s=quadl(speed,0,2);
>> s
```

Compare your answer to (b) with (a).

5. (You need NOT turn this in). Use `ezmesh` as in Matlab 0 to sketch the graphs of $z = x^2 + y^2$, $z = y^2 - x^2$, $z = \sin(y)$, and $z = 6 - 2y - x$.