MATH 5603 Homework 3

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Problem 8

```
a=1;
u=1;
b=a+u; % Just for first iteration
while b ~=a
    u=0.5*u;
    b=a+u;
end
u
```

```
u = 1.1102e-16
```

At the end of the loop $b = 1 + \prod_{i=1}^{n} 2^{-1}$ where n is such that the product is less than machine precision. We can test this out.

```
u=1;
b=a+u;
n=0;
while b ~=a
    u=0.5*u;
    b=a+u;
    n=n+1;
end

n-1
```

```
ans = 52
```

```
u=1;
for i=1:n-1
    u=0.5*u;
end
u
```

```
u = 2.2204e-16
```

```
eps
```

```
ans = 2.2204e-16
```

We see n is the number of bits allocated to the singnificand in IEEE floating point arithematic. There are 53 but one is for the sign bit.