Assignment 2 Design Document

mathlib.c:

#Includes various mathematical functions. Each function does the math function in its name.

EPSILON = 10^{-10}

my_sin(x):

```
total = x
term = x
For (n=1; term>EPSILON; n += 1):
        term = x/(2n)*x/(2n+1)*term
        total = total + term*(n%2=0)
return total
```

my_cos(x):

```
total = 1.0
term = 1.0
For (n=1.0; term>EPSILON; n += 1.0):
        term = x/(2n)*x/(2n-1)*term
        total = total + term*(n%2=0)
return total
```

my_arcsin(x):

```
curr
prev = pi
While (curr-prev >= EPSILON):
        curr = prev - (sin(prev)-x)/cos(prev)
return curr
```

my_arccos(x):

```
return pi/2-arcsin(x)
```

square_root(x):

Take provided code.

my_arctan(x):

return arcsin(x/sqrt(x^2+1))

Exp(x):

Take provided code.

my_log(x):

curr
prev = 1.0
While (curr-prev>=EPSILON):
    expon = Exp(prev)
    curr = prev + (x-expon)/expon
return curr

mathlib-test.c:

#Runs tests comparing mathlib.c to the standard math library.

Take arguments are run associated code:

-a:

Run all other code

-s:

print header
for (i=0; i<2pi; i += 0.05pi):
    print i, my_sin(i), math.sin(i), difference
break unless a

-c:

print header
for (i=0; i<2pi; i += 0.05pi):
    print i, my_cos(i), math.cos(i), difference
break unless a

-S:

```
print header
for (i=-1; i<1; i += 0.05):
        print i, my_arcsin(i), math.arcsin(i), difference
break unless a
```

-C:

```
print header
for (i=-1; i<1; i += 0.05):
        print i, my_arccos(i), math.arccos(i), difference
break unless a
```

-T:

```
print header
for (i=1; i<10; i += 0.05):
        print i, my_arctan(i), math.arctan(i), difference
break unless a
```

-I:

```
print header
for (i=1; i<10; i += 0.05):
        print i, my_log(i), math.log(i), difference
break unless a
```