Consider the integral

$$\int_a^b \sin(mx)\,dx.$$

The value of this integral (assuming m is not zero) is

$$-\frac{1}{m}\left(\cos(mb)-\cos(ma)\right).$$

Notice the variable m. This variable is called a *parameter*. A parameter is a variable that appears in an integral, but is not the variable of integration. Parameters are useful because they allow for the calculation of entire families of integrals. For example, knowing the formula above allows you to compute

$$\int_a^b \sin(2x)\,dx,\ \int_a^b \sin(5x)\,dx,\ \int_a^b \sin(\pi x)\,dx.$$

Integrals of the type above can be computed using MATLAB's `integral` function with some modifications to the syntax. It is still necessary to define the integrand but because this integrand has two variables, it requires two inputs.

```
function y = sinint(x,m)

y = sin(m*x);
```

When you need to compute the integral of this function, the syntax is slightly different. If you want to compute

$$\int_0^\pi \sin(3x)\,dx.$$

and try to do

```
I = integral(@sinint,0,pi);
```

you will get an error. This is because the integrand needs two inputs. We need a way to tell MATLAB that x is the variable of integration and m is a parameter. The way to do this is to use the syntax

```
m = 3;
I = integral(@(x)sinint(x,m),0,pi);
```

The `(x)` after the `@` sign tells MATLAB that the first input to the `sinint` function is the the variable of integration.

Use the discussion above to complete the problems below.

1) (2 pts) Compute

$$\int_0^2 e^{-rx}\,dx$$

for $r = 0.3$.

2) (3 pts) Compute

$$\int_0^4 \sin(mx)\cos(nx)\,dx$$

for $m = 0.5, n = 1.4$.

3) (5 pts) Compute the value of

$$I(r) = \int_0^1 e^{-rx}\cos(2x)\,dx$$

for $r = 0, 0.1, 0.2, \ldots, 1$. You should store the integrals in a vector. Your program should output a table of r and $I(r)$.