

Question #1:

```

#include <cmath>
#include <math.h>
#include <gsl/gsl_integration.h>
#include <iostream>
#include <iomanip>

using std::setprecision;

double f (double x, void * params) {
    double f = ((exp(x)-exp(-x))/(exp(x)+exp(-x)))*pow(x,x);
    return f;
}

int
main (void)
{
    gsl_integration_workspace * w
        = gsl_integration_workspace_alloc (1000);

    double result, error;
    double alpha = 1.0;

    gsl_function F;
    F.function = &f;
    F.params = &alpha;

    gsl_integration_qags (&F, 2, 3, 0, 1e-8, 1000,
        w, &result, &error);

    std::cout<<setprecision(22)<<"the answer is: \t"<<result<<".\n The estimated error is
: \t"<<error<<"\n The number of interval: \t"<<w->size<<std::endl;

    gsl_integration_workspace_free (w);

    return 0;
}

```

the answer is: 11.54026056218155815714.

```

The estimated error is:      1.281226298630761953398e-13
The number of interval:    1

```

Question #2:

```

gnuplot> set xrange [2:3]
gnuplot> plot ((exp(x)-exp(-x))/(exp(x)+exp(-x)))*x*x
gnuplot> set terminal postscript eps enhanced
Terminal type set to 'postscript'
Options are 'eps enhanced monochrome blacktext \
    dashed dashlength 1.0 linewidth 1.0 defaultplex \
    palfunccparam 2000,0.003 \
    butt "Helvetica" 14'
gnuplot> set output "myplot.eps"
gnuplot> replot

```

Question #3:

```

#include <iostream>
#include <gsl/gsl_rng.h>
#include <gsl/gsl_randist.h>

```

```

int
main (void)
{
    const gsl_rng_type * T;
    gsl_rng * r;

    int i, n = 10;

    /* create a generator chosen by the
       environment variable GSL_RNG_TYPE */

    gsl_rng_env_setup();

    T = gsl_rng_default;
    r = gsl_rng_alloc (T);

    /* print n random variates chosen from
       the poisson distribution with mean
       parameter mu */

    for (i = 0; i < n; i++)
    {
        double k = gsl_rng_uniform (r);
        double j = 25+12*k;

        std::cout<<j<<"\t"<<std::endl;
    }

    printf ("\n");
    gsl_rng_free (r);
    return 0;
}

```

```

36.9969
26.9549
28.3914
36.3664
27.7799
30.8197
36.4897
33.9317
31.4805
33.8794

```

Question #4:

```

#include <iostream>
#include <gsl/gsl_rng.h>
#include <gsl/gsl_randist.h>
#include <math.h>

int
main (void)
{
    const gsl_rng_type * T;
    gsl_rng * r;

    int i, j, n = 10000, drunks=100;
    double a=0,b=2, direction[n], distance=0,abs=0, Average=0;

    T = gsl_rng_default;

```

```
r = gsl_rng_alloc (T);
```

```
    srand((time(0)));
    long int seed = random();
    gsl_rng_env_setup();
    gsl_rng_set(r,seed);
```

```
for( i=0; i < drunks; i++){
    for (j = 0; j < n; j++)
    {
        unsigned int k = gsl_ran_flat (r, a, b);

        if(k==0){
            direction[i] =-1;
        }
        else direction[i] = 1;
        distance+=direction[i];

    }

    abs=fabs(distance);
    Average+=abs;
}

Average /= drunks;
```

```
    std::cout << " the average distance D a drunk is from his/her starting position at the
end of the journey of 10, 000 steps is: \t" << Average << "\n"<<std::endl;
    gsl_rng_free (r);
    return 0;
}
```

the average distance D a drunk is from his/her starting position at the end of the journey of 10, 000 steps is: 861.31

Question #5:

```
(a)
f(x) = 1/sqrt(pi)*exp(-x**2)*x**2;
plot f(x)
set terminal postscript eps enhanced
set output "myplot2.eps"
replot
set output
set terminal X11
```

(b)

```
#include <cmath>
#include <math.h>
#include <gsl/gsl_integration.h>
#include <iostream>
#include <iomanip>
```

```
using std::setprecision;
```

```
double f (double x, void * params) {
    double f = 1/sqrt(3.14159)*exp(-pow(x,2))*pow(x,2);
```

```
    return f;
}

int
main (void)
{
    gsl_integration_workspace * w
        = gsl_integration_workspace_alloc (1000);

    double result, error;
    double alpha = 1.0;

    gsl_function F;
    F.function = &f;
    F.params = &alpha;

    gsl_integration_qags (&F, 0.995, 1.005, 0, 1e-8, 1000,
        w, &result, &error);

    std::cout<<setprecision(22)<<"the answer is: \t"<<result<<".\n The estimated error is
: \t"<<error<<"\n The number of interval: \t"<<w->size<<std::endl;

    gsl_integration_workspace_free (w);

    return 0;
}
```

the answer is: 0.002075503771752365816256.