STA 3431 Assignment #2

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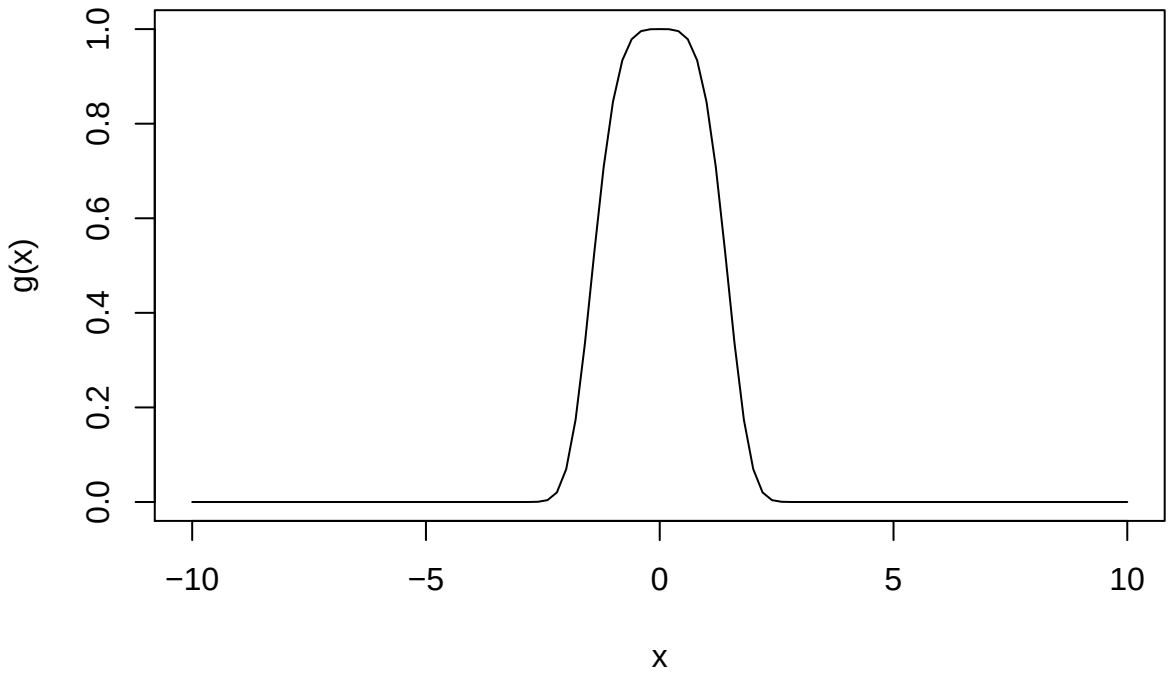
Question 1

First let's take a look at the target density function. Because $-\frac{-x^4}{6} \leq 0$ on R, and e^x is increasing on R^-, we know the target density function should be larger around 0 and should get smaller further away from 0. Let's verify that.

```
g = function(x) {
  return(exp(-x^4/6))
}

curve(g, from=-10, to=10)
```



As we can see, the value for g(x) drops drastically around -2.5 and 2.5. As MCMC works better if the initial value covers the "important" parts of the state space, we choose X_0 using a uniform distribution $U(-2.5, 2.5)$.

```
h = function(y) { return(y^2) }

M = 11000  # run length
```

```
B = 1000  # amount of burn-in
X = runif(1)  # overdispersed starting distribution
sigma = 1  # proposal scaling
xlist = rep(0,M)  # for keeping track of chain values
hlist = rep(0,M)  # for keeping track of h function values
numaccept = 0;

for (i in 1:M) {
    Y = X + sigma * rnorm(1)  # proposal value
    U = runif(1)  # for accept/reject
    alpha = g(Y) / g(X)  # for accept/reject
    if (U < alpha) {
    X = Y  # accept proposal
        numaccept = numaccept + 1;
    }
    xlist[i] = X;
    hlist[i] = h(X);
}
```

σ^2