Probability 1 Quiz 9 Semester I 2016/17

Ground Rules: Time allowed is 20 minutes, individual work only and closed book test.

Your name ______________ Score :

1. The heights of women are normally distributed with a mean of 65 inches and a standard deviation of 2.5 inches. My daughter is 63.35 inches. Using the normal tables (backside), find the percentage of women that are taller than my daughter.

Let X be the random variable which represent the heights of women.

Given $X \sim \text{Normal}(\mu, \sigma^2)$ when $\mu = 65$

$\sigma = 2.5$

We want to calculate

$$\mathbb{P}[X > 63.35]$$

Define $Z = \frac{X-\mu}{\sigma}$. Since $X \sim \text{Normal}(\mu, \sigma^2)$, So

Z is Normal $(0, 1)$

Now $\mathbb{P}[X > 63.35] = \mathbb{P}\left[Z > \frac{63.35 - 65}{2.5}\right] = \mathbb{P}[Z > -0.66]$

Since $-Z$ is also Normal$(0,1)$ {Normal Random variables are Symmetric about mean}

we get $\mathbb{P}[Z > -0.66] = \mathbb{P}[Z < 0.66] = \mathbb{P}[Z \le 0] + \mathbb{P}[0 < Z < 0.66]$

Again since Normal random variables are symmetric about mean,

$\mathbb{P}[Z \le 0] = \frac{1}{2}$

And $\mathbb{P}[0 < Z < 0.66] = \frac{1}{\sqrt{2\pi}} \int_0^{0.66} e^{-x^2/2} dx = 0.2454$ {From table

So $\mathbb{P}[X > 63.35] = 0.5 + 0.2454 = 0.7454$

So, percentage of women taller than given person is

$74.54\ \%$