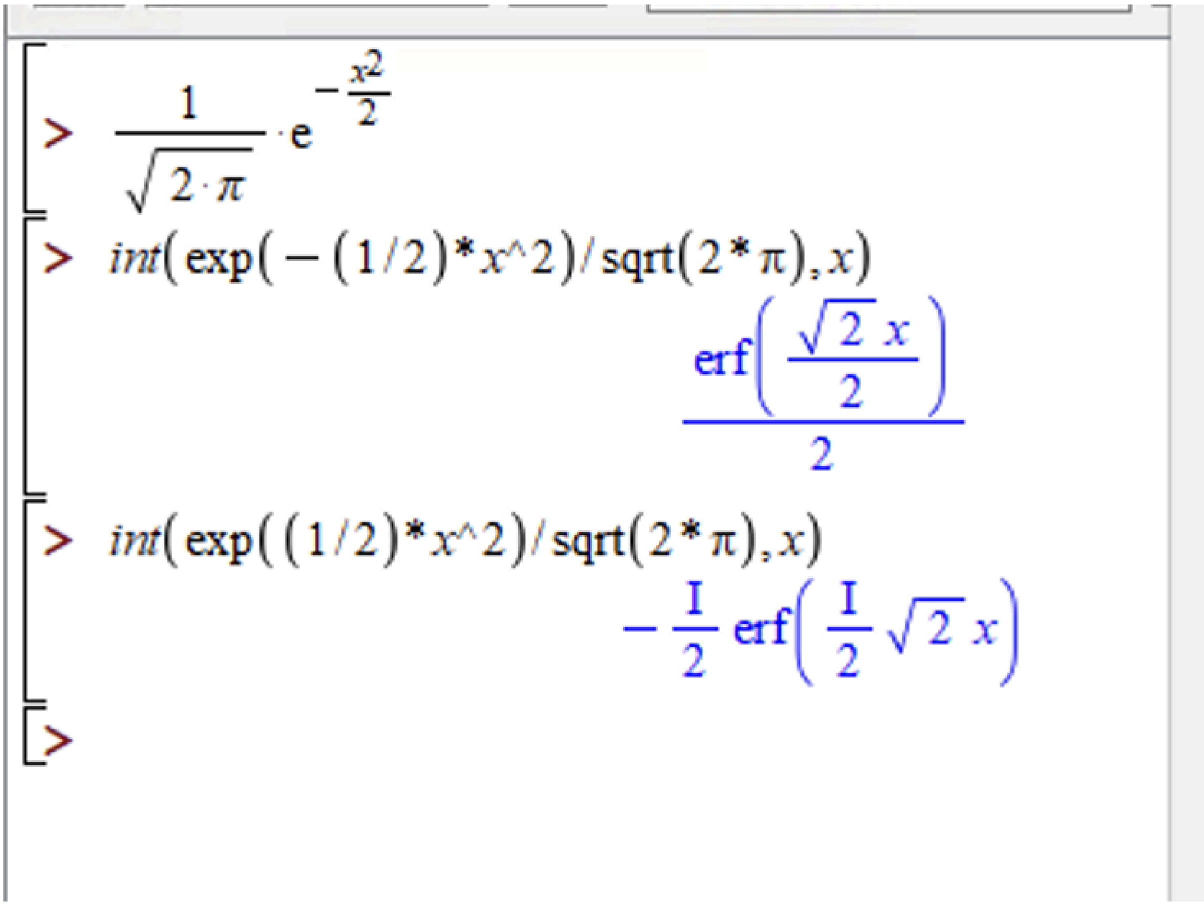
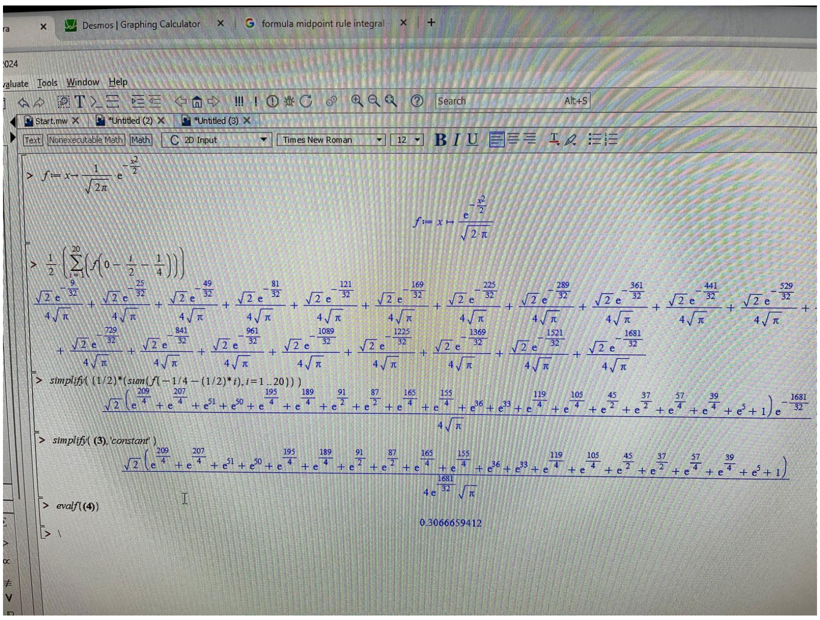
Objective 1
The expression above is the standard normal pdf function.
Objective 2

It basically means that the normal distribution pdf does not have a close form



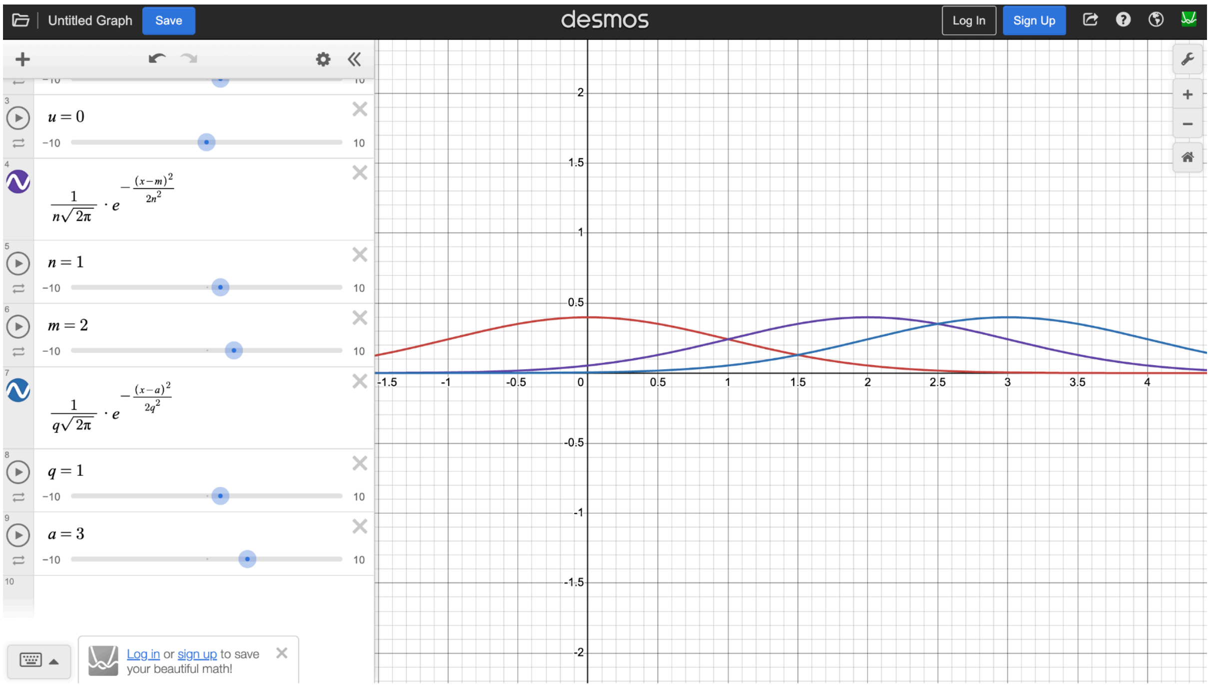
Objective 3
I got around 30%



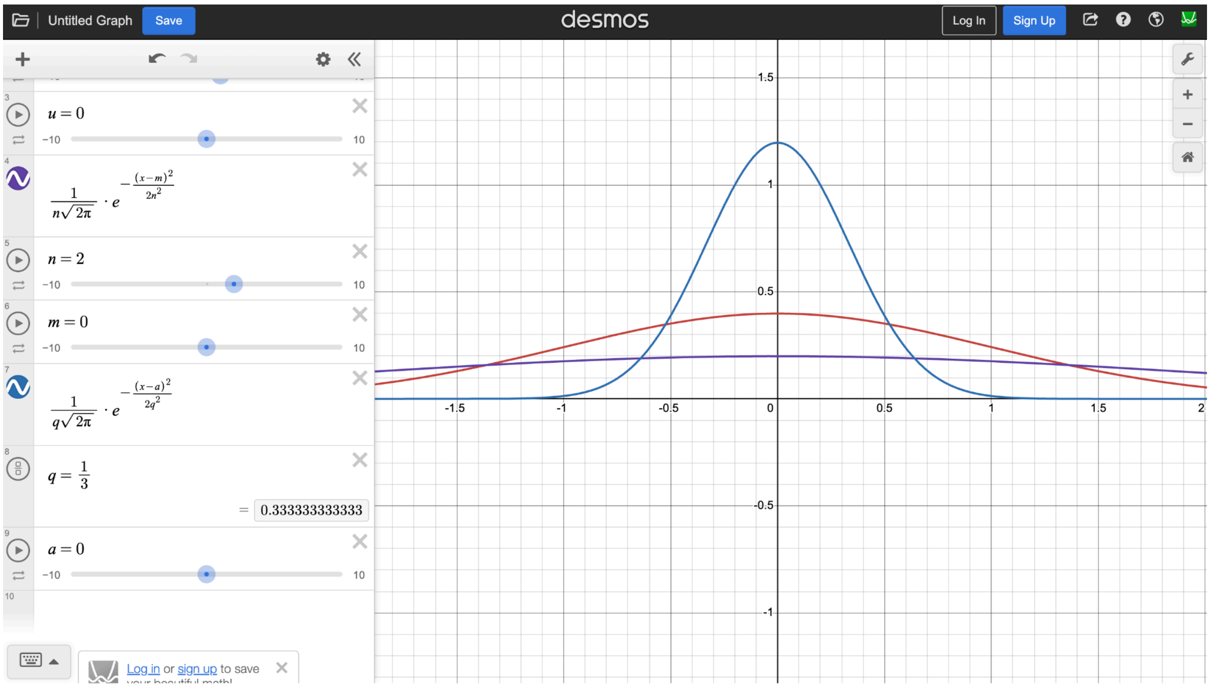
The place where I saw a similar result was on the z table. I saw a close result who is the value of 1.00 (.84134) and 0 (.50000) when you subtract these two you will get a similar result of 0.3413 and like explained in class the result of the z score table are off because of accuracy on how they were calculated.

Objective 4

This is the curve modifying the mean

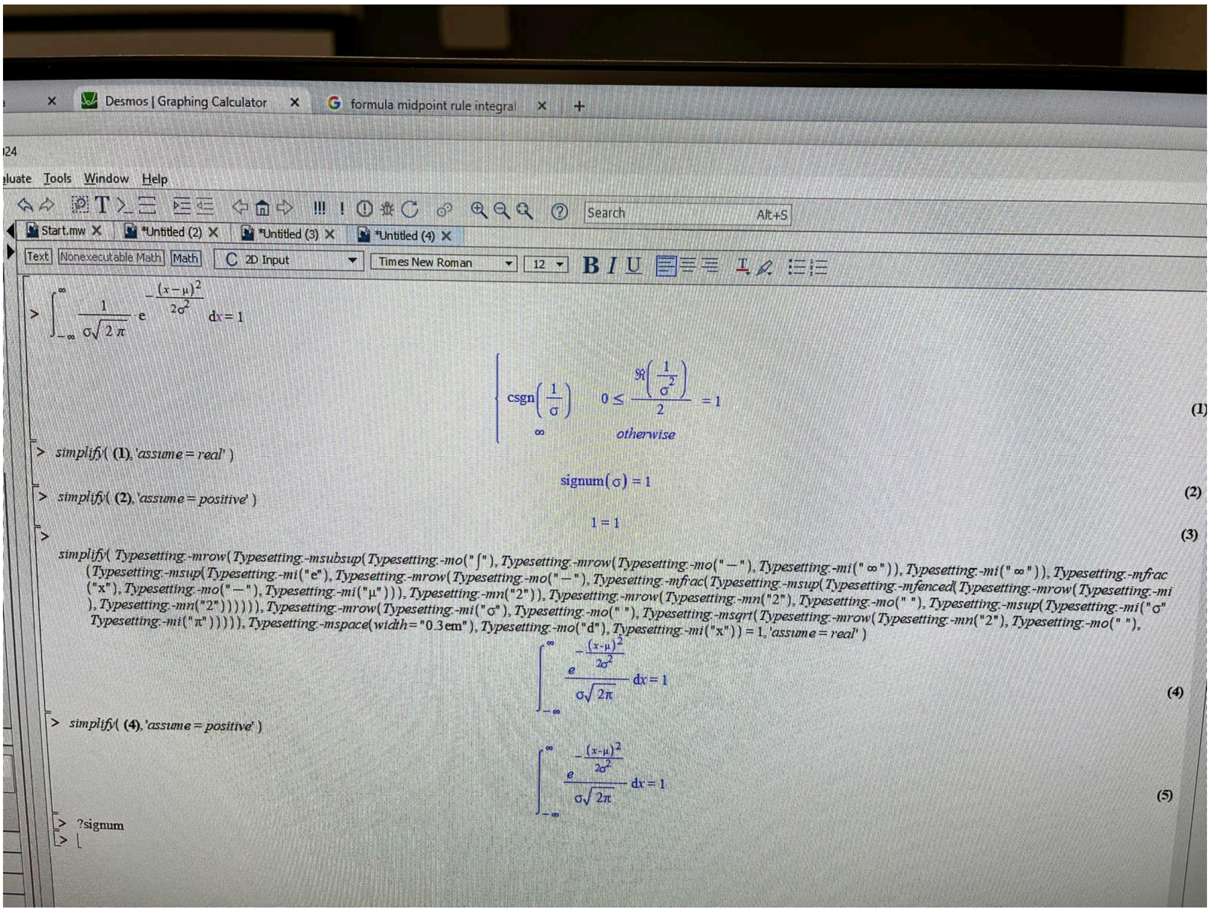


This is the curve modifying the other one



The mean determines the center (the weight of where it is). Then the other modifies how big the gap will be between the population on the edges and on the middle.

Objective 5



The signum function on Maple is meant to map the numbers. So if a number is negative becomes -1 if the number is positive becomes 1. In this case, we assume that it is meant to be positive therefore, the result of the function will be 1.

The result is that we will reach the value of 1 which shows that this function is a pdf function.

Objective 6

In this question, I first set up the mean which is $\int_{-\infty}^{\infty} x\, f(x)\, dx = \mu$

where $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$

since we need to verify the mean for the normal distribution, we need to integrate using MAPLE and the output follows

$$> \int_{-\infty}^{\infty} x \cdot \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}} \, dx$$

$$\begin{cases} \mu \operatorname{csgn}\left(\frac{1}{\sigma}\right) & 0 \leq \frac{\Re\left(\frac{1}{\sigma^2}\right)}{2} \\ \infty & \mathit{otherwise} \end{cases} \quad (6)$$

$> simplify((6), 'assume = real')$

$$\mu \operatorname{signum}(\sigma) \quad (7)$$

$> simplify((7), 'assume = positive')$

$$\mu \quad (8)$$

This proves that mean for the normal distribution is indeed μ

Objective 7

In this question, we need to verify the standard deviation for the normal distribution where the standard deviation for a random variable with probability density function f and mean μ is defined by $\sigma = [\int_{-\infty}^{\infty} (x - \mu)^2 f(x) dx]^{\frac{1}{2}}$

$$> \left[\int_{-\infty}^{\infty} (x-100)^2 \cdot \frac{1}{15\cdot\sqrt{2\pi}} \cdot e^{\left(\frac{-(x-100)^2}{450}\right)} \, dx\right]^{\frac{1}{2}}$$

$$\sqrt{[225]} \quad (5)$$

$> \sqrt{225}$

$$15 \quad (6)$$

since f(x) = $\frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$ and I let σ as 15, and the resultant is 15, the condition where $\sigma = [\int_{-\infty}^{\infty} (x - \mu)^2 f(x) dx]^{\frac{1}{2}}$ is met.

Objective 8

Normal distribution in some problems concerning probabilities where the value of IQ scores that are normally distributed with a mean of 100 and a standard deviation of 15

> $\displaystyle\int_{85}^{115} \frac{1}{15\cdot\sqrt{2\cdot\pi}}\cdot e^{\frac{-(x-100)^2}{450}}\,dx$

$$\operatorname{erf}\left(\frac{\sqrt{2}}{2}\right)$$

> *evalf*[5](**(1)**)

$$0.68269$$

> $\displaystyle\int_{140}^{\infty} \frac{1}{15\sqrt{2\pi}}e^{\frac{-(x-100)^2}{450}}\,dx$

$$\frac{1}{2}-\frac{\operatorname{erf}\left(\frac{4\sqrt{2}}{3}\right)}{2}$$

> *evalf*[5](**(3)**)

$$0.00383$$