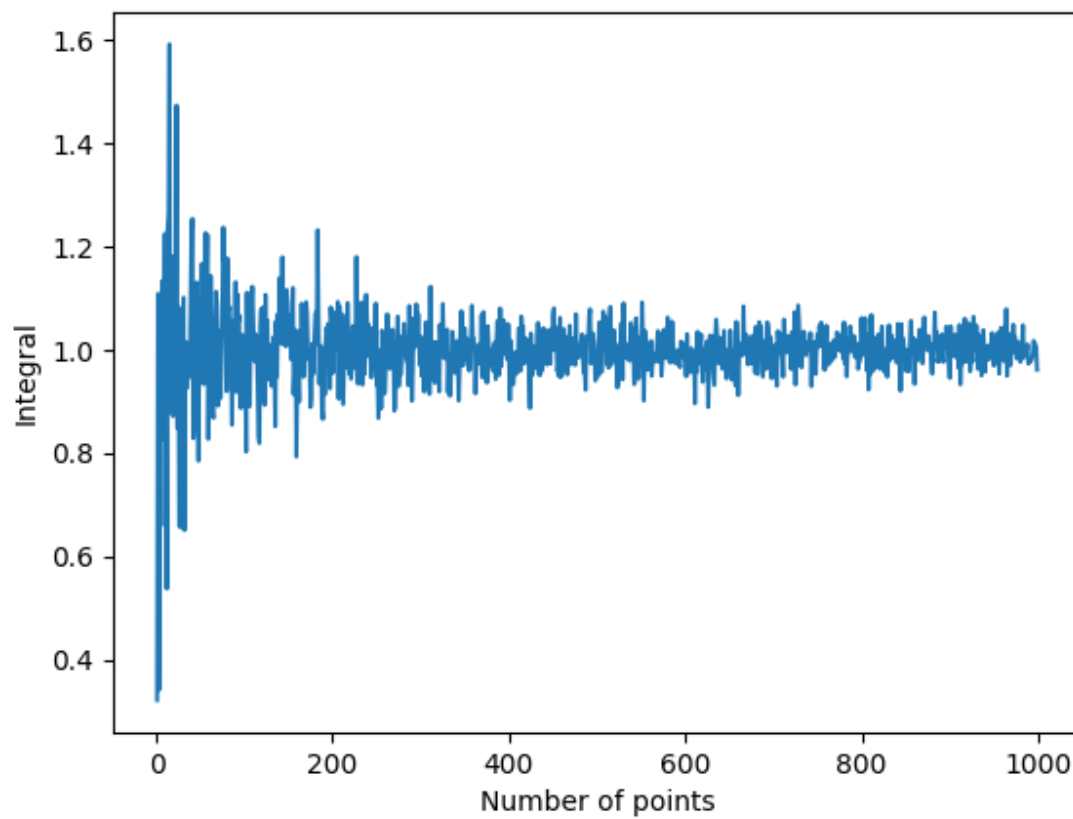


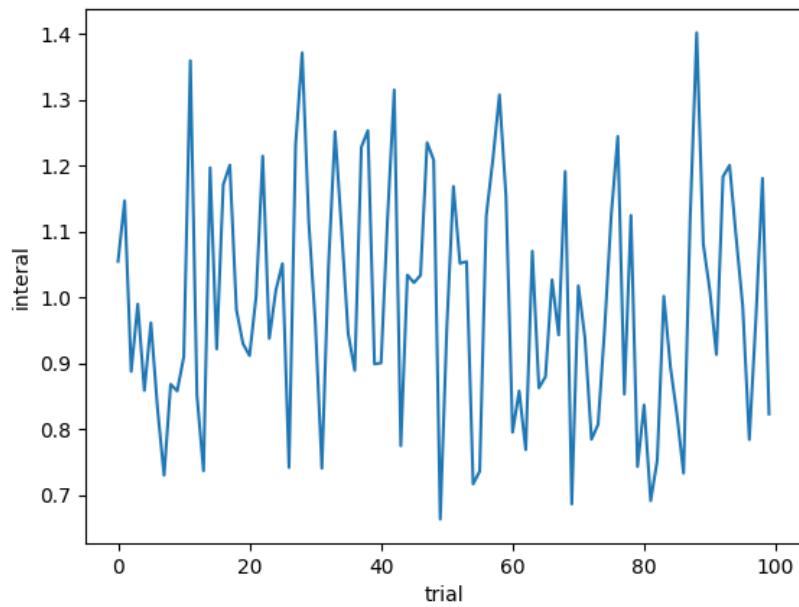
Integration using Monte Carlo

1. $\int_0^1 3x^2 dx$

1) Plot of Integral vs No. of points

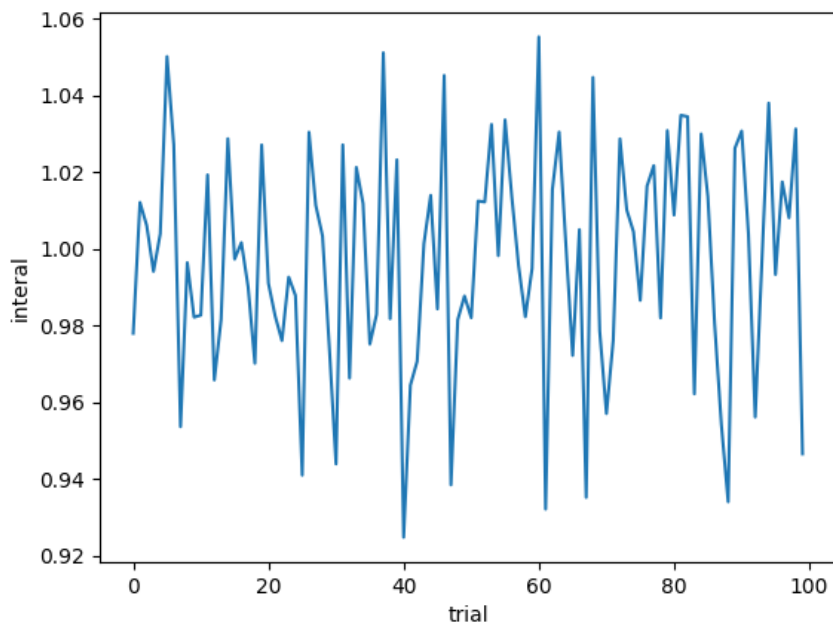


2) Integral for 20 points over 100 trials



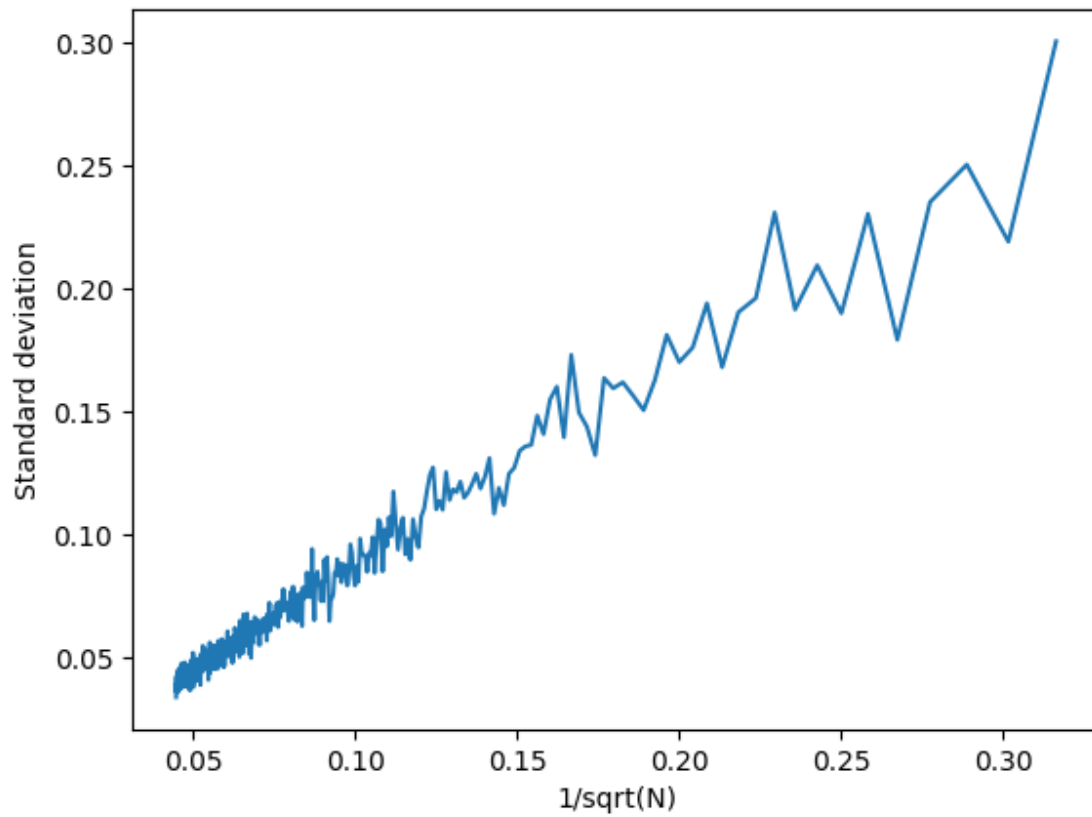
The standard deviation was **0.1777**

3) Integral for 1000 points over 100 trials



The standard deviation was **0.0296**

4) Plot of standard deviation vs $1/\sqrt{N}$ (N is number of points)

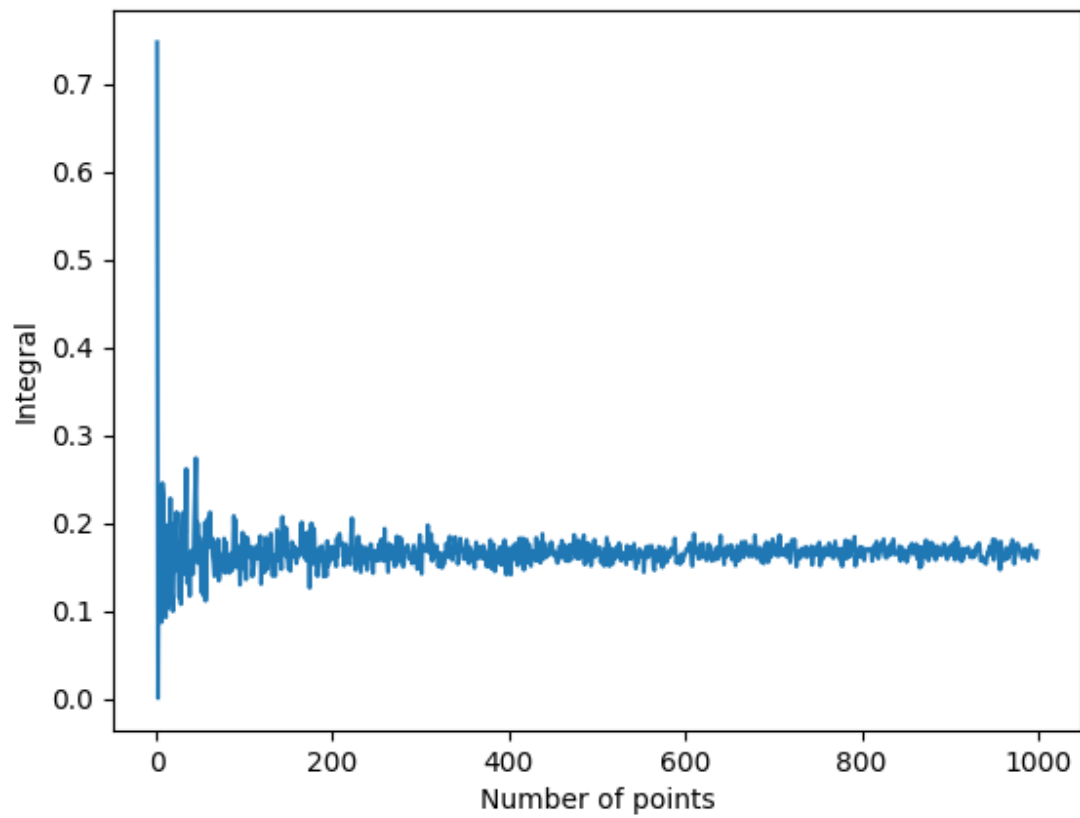


We see that the trend is fairly linear, especially for higher N (lower $1/\sqrt{N}$).

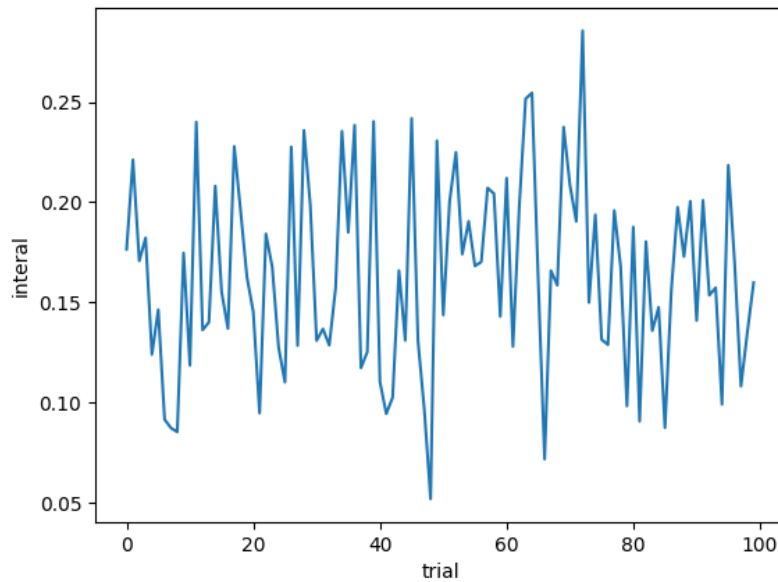
Therefore, standard deviation is inversely proportional to \sqrt{N} .

2. $\int_0^1 \int_0^1 x^2 y \, dx dy$

1) Plot of Integral vs No. of points

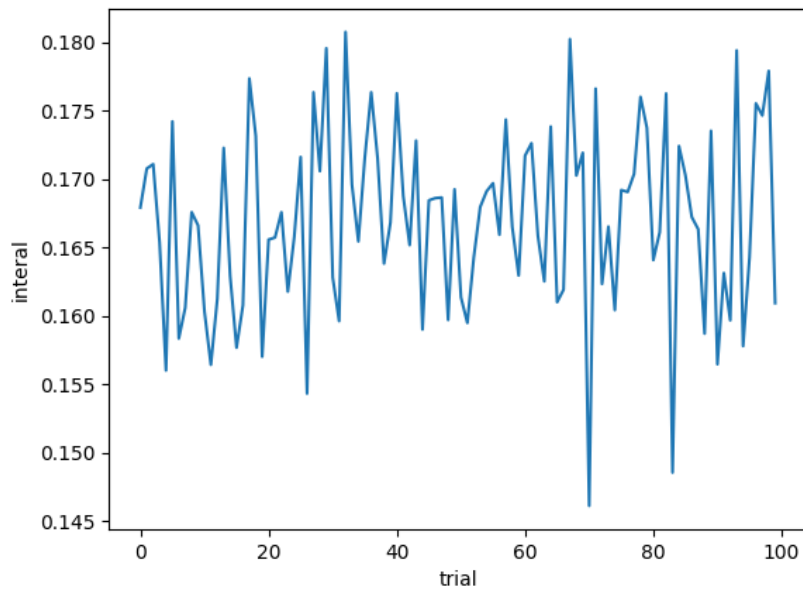


2) Integral for 20 points over 100 trials



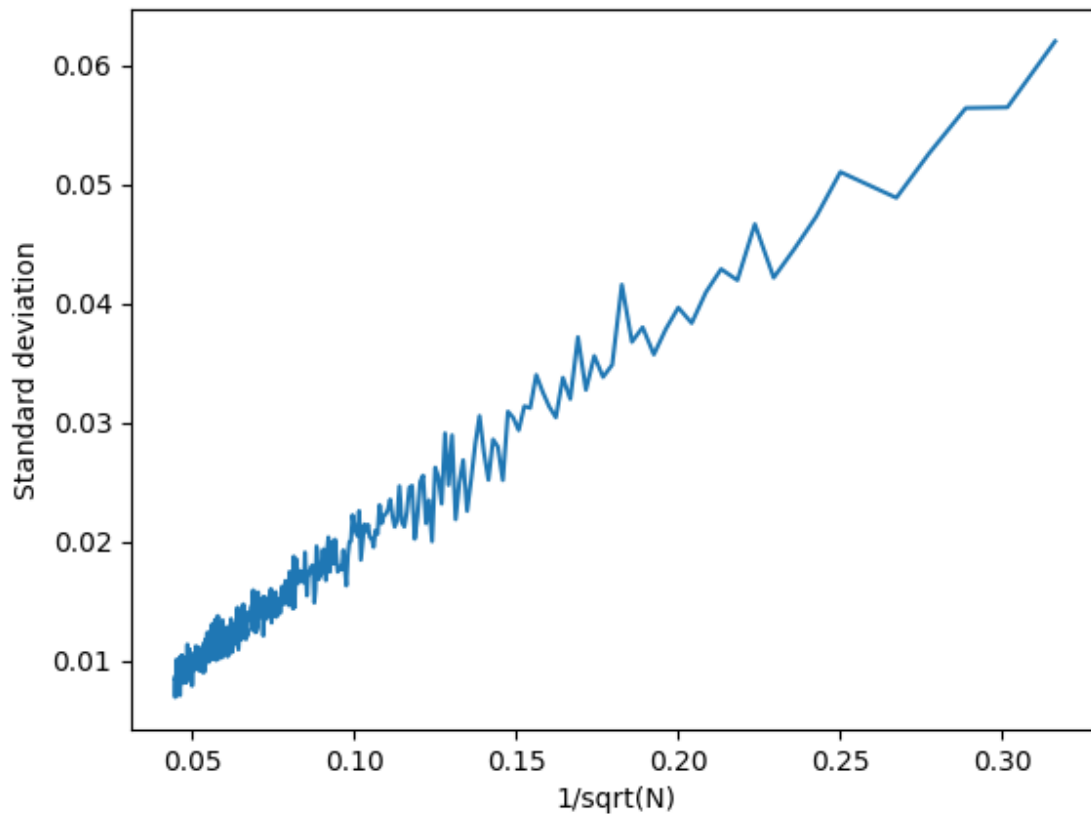
The standard deviation was **0.0476**

3) Integral for 1000 points over 100 trials



The standard deviation was **0.0068**

4) Plot of standard deviation vs $1/\sqrt{N}$ (N is the number of points)



Again, the trend appears linear and the linearity is more pronounced for higher values of N (lower $1/\sqrt{N}$).

Therefore, standard deviation is inversely proportional to \sqrt{N} .