Range for random sequence

[Award] **8 pts**

[Category] **Probability**

There are *n* (*n* > 1) independent and identically distributed random variables whose cumulative distribution function is



Let *R* be the range for this random variables (difference between maximum and minimum). Let *E*(*n*) be the expected value of *R*. Obviously *E*(*n*) is between 0 and 1, furthermore it is rational number. You are given *E*(2) = 4/15 and *E*(3) = 2/5.

Find *E*(20). Give your answer rounded to 10 digits after the decimal point.

Thanks to **baihacker** for the idea.

[Answer] **0.7810647283**