MAP30#2

Question 1

```
ClearAll["Global`*"]
𝒟 = WeibullDistribution[2, 1];
xis = Table[xᵢ, {i, 1, 4}];
dists = Table[{xᵢ, 𝒟}, {i, 1, 4}];
ℛ3OutOf4 =
  ReliabilityDistribution[BooleanCountingFunction[{3, 4}, xis], dists];
Mean[ℛ3OutOf4] (* exact expected value; not requested *)
N[%, 6]
SurvivalFunction[𝒟, t]
R[t_] = Exp[-t²];
(* alternative way of obtaining the exact expected value *)
R3OutOf4[t_] = FullSimplify[1 - CDF[BinomialDistribution[4, Exp[-t²]], 3 - 1]];
∫₀^R[t] R3OutOf4[t] 𝕕t
FullSimplify[1/12 (-9 + 8 √3) R[u]^(R[t+u]/R[t])]
μ* = Mean[𝒟]
μ*
1/3 (-9 + 8 √3) √π (* Lower limit to E(TT); not requested *)
N[%, 6]

∫₀^∞ (1 - (1 - Exp[-t/μ*])²) 𝕕t (* Upper limit to E(TT) *)
N[%, 6]
```

$$\begin{cases} e^{-t^2} & t > 0 \\ 1 & \text{True} \end{cases}$$

$$e^{t^2-(t+u)^2}$$

$$e^{-2tu}$$

$$\frac{\sqrt{\pi}}{2}$$

$$\frac{\sqrt{\pi}}{6}$$

0.295409

$$\frac{3\sqrt{\pi}}{4}$$

1.32934

```
ClearAll["Global`*"]
𝒟 = WeibullDistribution[2, 1];
xis = Table[xᵢ, {i, 1, 4}];
dists = Table[{xᵢ, 𝒟}, {i, 1, 4}];
ℛ3OutOf4 =
  ReliabilityDistribution[BooleanCountingFunction[{3, 4}, xis], dists];
Mean[ℛ3OutOf4] (* exact expected value; not requested *)
N[%, 6]

(* alternative way of obtaining the exact expected value *)
R3OutOf4[t_] = FullSimplify[1 - CDF[BinomialDistribution[4, Exp[-t²]], 3 - 1]];
∫₀^∞ R3OutOf4[t] dt
```

$$\frac{1}{12}\left(-9+8\sqrt{3}\right)\sqrt{\pi}$$

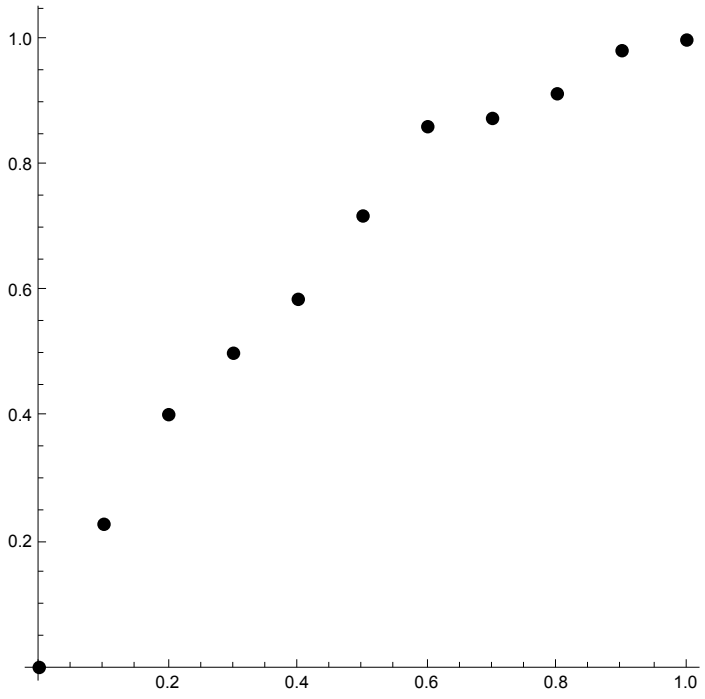
```
0.717313
```

$$\frac{1}{12}\left(-9+8\sqrt{3}\right)\sqrt{\pi}$$

Question 2

```
ClearAll["Global`*"]
𝒟 = WeibullDistribution[2, 1];
n = 10;
sorteddata = Sort[RandomVariate[𝒟, n]];

t = sorteddata;
t[[0]] = 0;
ListPlot[Prepend[Table[{i / n, (∑ⱼ₌₁^i (n - j + 1) × (t[[j]] - t[[j - 1]])) / (∑ⱼ₌₁^n (n - j + 1) × (t[[j]] - t[[j - 1]]))}, {i, 1, n}],
  {0, 0}], AspectRatio → 1, PlotStyle → {PointSize[Large], Black}]
```



```
(* QuantilePlot[sorteddata,𝒟,PlotStyle→{PointSize[Large],Black}]
 ProbabilityPlot[sorteddata,𝒟,PlotStyle→{PointSize[Large],Black}] *)
KolmogorovSmirnovTest[sorteddata, 𝒟, "HypothesisTestData"]

𝒟estim = EstimatedDistribution[sorteddata, WeibullDistribution[α, δ]]
Median[𝒟estim]
alphaestim = 2.059;
deltaestim = 0.962;

deltaestim × Sqrt[-Log[0.5], alphaestim]
```

HypothesisTestData[Type: KolmogorovSmirnovTest
p–Value: 0.986]

```
WeibullDistribution[2.05899, 0.961894]

0.805045

0.805134
```