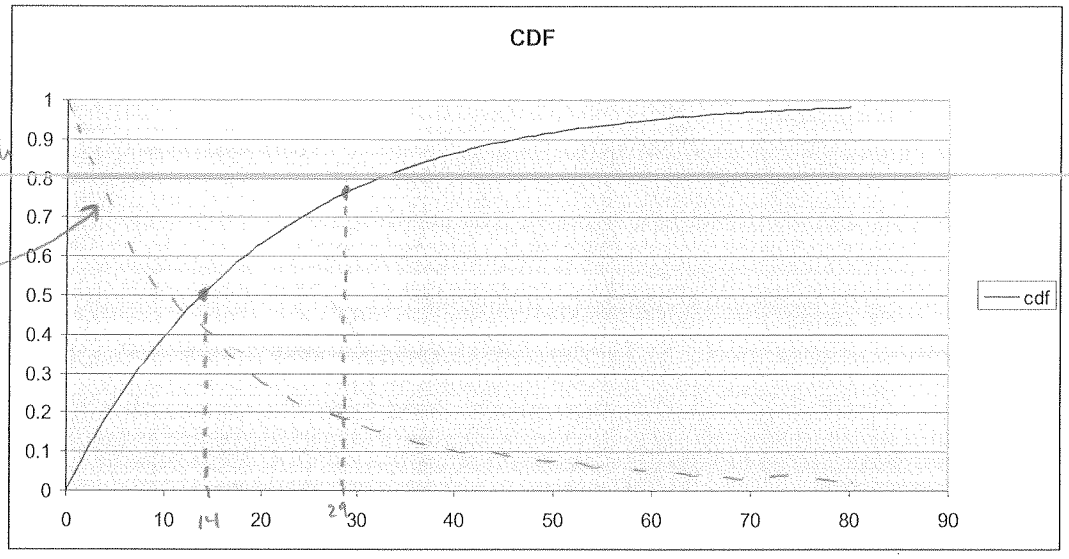
MA206 Suggested Problems
Cumulative Distribution Functions

1. Answer the following questions based on the CDF below:

The PDF is the derivative of the CDF. We can sketch this



a. What does the probability density function (PDF) for the following cumulative distribution function (CDF) look like and why? Sketch the PDF on the CDF above.

b. Approximately 50% of the observations will be less than what x-value?

About 14

c. Approximately 75% of the observations will be less than what x-value?

About 29

2. What can you say about the probability mass over the domain of the PDF (what is it equal to and why)?

P(Domain of PDF) = 1
from Axioms of Probability, $P(S) = 1$

3. What is the range for all CDFs? Why?

Range for CDFs → [0, 1]
If you look @ a CDF value for a given value of "x", it represents a percentage of all observations (or occurances) that are at or less than the value of "x". Thus, all percentages are between 0 & 1

4. What happens to the EDF as we take more observations from a population? What if the sample size goes to ∞?

As we take more observations from a population, the EDF becomes more smooth and better represents the CDF. As the sample size goes to ∞, the EDF becomes the CDF.

5. Fit either an Exponential Distribution F(x) or a Weibull Distribution G(x) to the following data. The data set is available as a link on the syllabus (*Data5*).

6.52	8.99	7.78	23.05	6.58	2.33	48.67	6.71	3.18	1.14
0.21	22.84	2.17	14.80	34.89	4.64	7.25	14.42	41.01	37.94
2.20	13.80	5.52	30.14	4.02	11.49	6.75	1.69	31.08	13.62
31.42	1.40	14.11	10.73	9.46	1.92	25.81	22.69	0.79	12.53
38.49	5.26	22.61	0.18	31.31	28.25	14.26	3.74	8.59	6.59

Which distribution did you pick? Why? What is (are) the parameter value(s) for this distribution?

Exponential Distribution

$F(x) = 1 - e^{-0.068881x}$ $\quad \lambda = 0.068881 \quad x \geq 0$

$SSE = 0.086918$

Weibull Distribution

$G(x) = 1 - e^{-\left(\frac{x}{14.67674}\right)^{0.939819}}$ $\quad \alpha = 0.939819$, $\beta = 14.67674 \quad x \geq 0$

$SSE = 0.074202$

Either distribution is acceptable. Weibull is slightly better because of a smaller SSE.