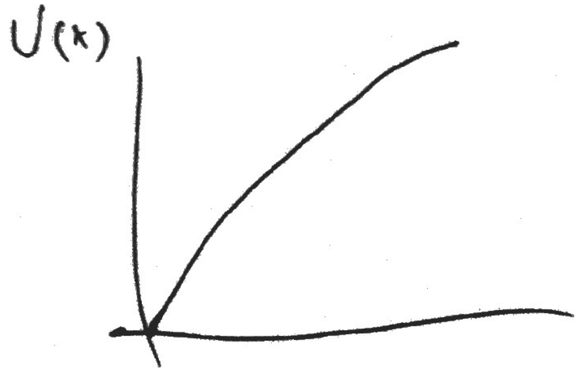
#1

Customers who is risk adverse are willing to pay premiums that are higher than expected loss. They like sure small loss (premium) than possibility of large loss.

Utility function of risk adverse people should be increasing, with decreasing derivatives. (concave down).



#2

$n = 100{,}000$

$S \sim U(10, 20)$

$$X = \begin{cases} 0 & \text{w.p. } .95 \\ S & \text{w.p. } .05 = p \end{cases}$$

$E(X) = p\,E(S)$

$= .05(15) = \boxed{7.5}$

$E(X^2) = .05\,E(S^2) = .05\left[V(S) + E(S)^2\right]$

$= .05\left[\frac{10^2}{12} + 7.5^2\right] = \boxed{3.23}$

Individual Risk model

$S = X_1 + \cdots + X_n$

$\theta = 1.65 \frac{E(S)}{\sqrt{V(S)}}$

$= 1.65 \frac{E(X)}{\sqrt{V(X)\,n}} = \boxed{.0218}$

$$C = (1+\theta)\, E(S)$$

$$= (1.0218) \sum_{n} E(X) \quad \text{for all.}$$

$$C = 1.0218\, E(X) \quad \text{per policy holder}$$

$$= \boxed{7.6635}$$

# #3

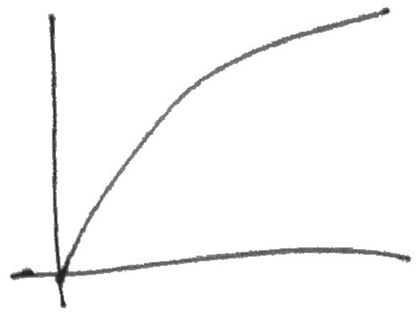
Utility func. $u(x) = x^{.7}$

uas missing *

Wealth = 30

Customer

premium $c =$



Don't buy Ins. vs Buy Ins.

$E[u(w-x)]$ *vs $E[u(w-c)]$

$$E[(30-x)^{.7}] = .05 \int_{10}^{20} (30-z)^{.7} \frac{1}{20}\, dz$$

$$= (30 - 7.1635)^{.7}$$

$$= \underline{\underline{8.797}}$$

$$= \frac{(.05)}{20} \int \frac{(30-x)^{1.7}}{1.7} \Big|_0^{20}$$

$$= -0.166$$

$E[U(w-x)] \leq E[U(w-c)]$ will buy Insurance.

$= -0.166$ $\quad 8.797$

Set

$-0.166 = E[U(30-c)]$ and solve for c for max prem this customer is willing to pay.

# #4

per-year → Discrete Time setting.

Calculate $\delta$ → $\psi(u) \leq e^{-\delta u}$

$\phi(u) \geq 1 - e^{-\delta u}$

$e^{-ct} M_{X(7)} = 1$ → $c = 7.6635$

$e^{-ct}\left(\frac{e^{20t} - e^{10t}}{10t}\right) = 1$

solve for $t$ to find $\delta$.

use $\phi(u) \geq 1 - e^{-\delta u}$ to find $u$.

Make sure you can do the

same problems for

Continuous-time / compound poisson

Model.