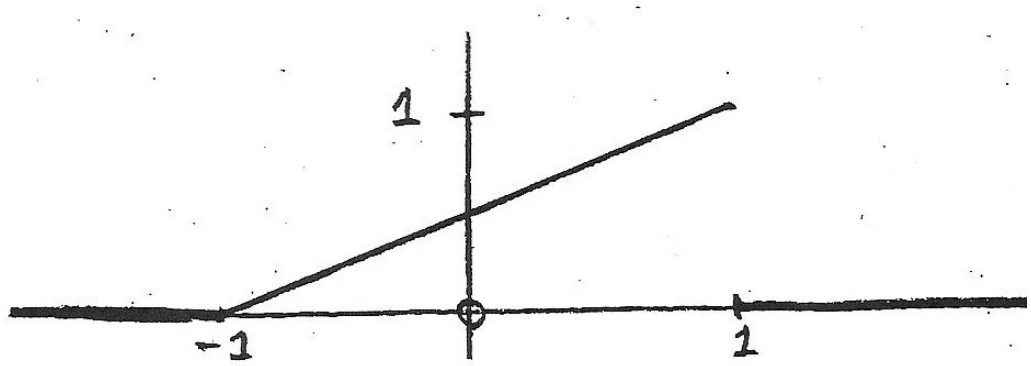
MATH 128 EXAM 2 REVIEW QUESTIONS --- FALL 2008

1. Suppose X is a random quantity taking values x with $-1 \le x \le 1$ and probability density $p(x)$ given by the following graph.



Calculate $P(X \ge 0)$

2. Suppose we are given the cumulative distribution function $F(x) = \begin{cases} 0 & , x \le 0 \\ 1 - e^{-5z} & , x \ge 0 \end{cases}$

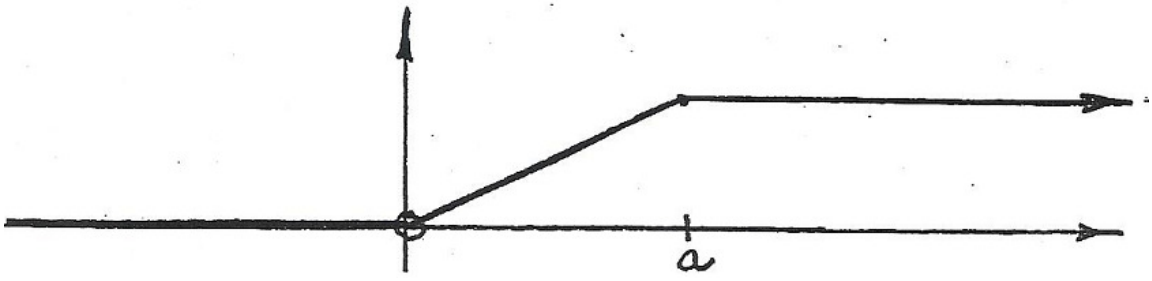
Find the mean of the distribution.

3. Suppose a quantity is distributed with probability density function $f(x) = \frac{10}{9} \cdot x^{-2}$ on $1 \le x \le 10$. Find the **median** of this distribution for this quantity. (**Hint**: Calculate $F(x) = \int_1^x \frac{10}{9} t^{-2} dt$ and solve for $F(x) = \frac{1}{2}$.)

4. After measuring the duration of many telephone calls, the telephone company modeled their data with a probability density function $f(t) = 0.2e^{-0.2t}$, where t is the duration of a call in minutes. About what percentage of calls lasted from 4 to 6 minutes?

5. The density function $f(x)$ for the radius (measured in millimeters) of a spherically shaped raindrop in a rainstorm is **constant** over the range $0 < x < 5$ and zero elsewhere. The cumulative distribution function $F(x)$ is $\begin{cases} \frac{x}{5} & ,0 < x < 5 \\ 1 & ,5 \le x \end{cases}$.

6. Suppose a random variable X has a CDF with the graph given below.



Sketch the graph of its PDF.

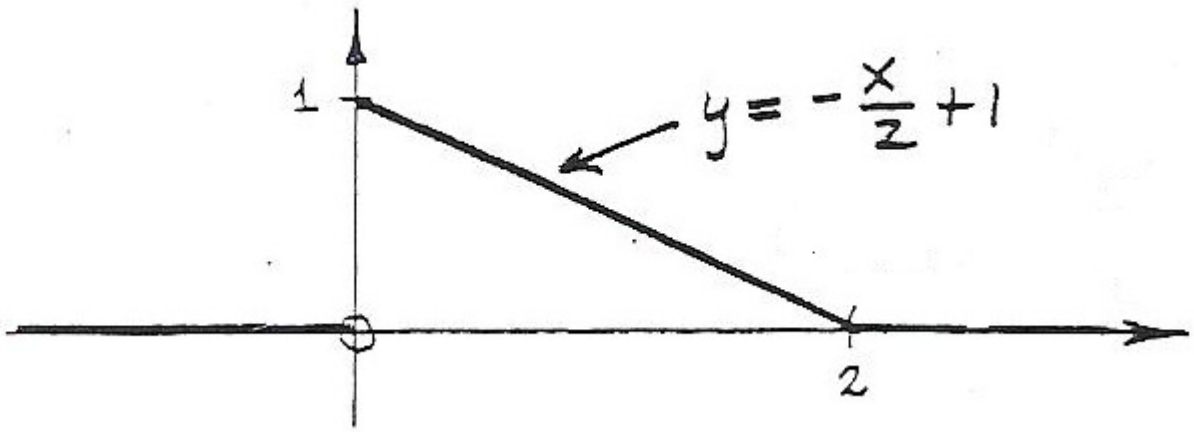
7. Determine k so that $\int_0^\infty xe^{-kx}dx = 9$.

8. Suppose a distribution of test scores is modeled by a normal distribution with a mean $\mu = 50$ and a standard deviation $\sigma = 15$. Then the probability density $p(x)$ for this distribution is given by the following formula:

9. The speeds of cars on a crowded interstate highway are approximately normally distributed with mean $\mu = 55$ mph and standard deviation $\sigma = 10$ mph. What fraction of cars is traveling between 50 and 65 mph?

10. Let $p(x) = \frac{k}{(x+1)^5}$ be a PDF for $0 \le x \le \infty$. Determine the value of k.

11. Suppose a PDF is given in the graph below. Then the CDF $F(x)$ for $0 \le x \le 2$ is



12. Suppose X is a random variable whose PDF has the graph in no.11. Calculate $P(X \le 1)$

13. Suppose X is a random variable whose CDF is given by

$$F(x)=\begin{cases}0, & x<0;\\ x^3, & 0\le x\le 1;\\ 1, & 1<x\end{cases}$$

and whose PDF is given by

$$f(x)=\begin{cases}0, & x<0;\\ 3x^2, & 0\le x\le 1;\\ 0, & 1<x\end{cases}$$

Then the mean for this random variable is:

14. Using the CDF of no. 13 calculate the median for this distribution.

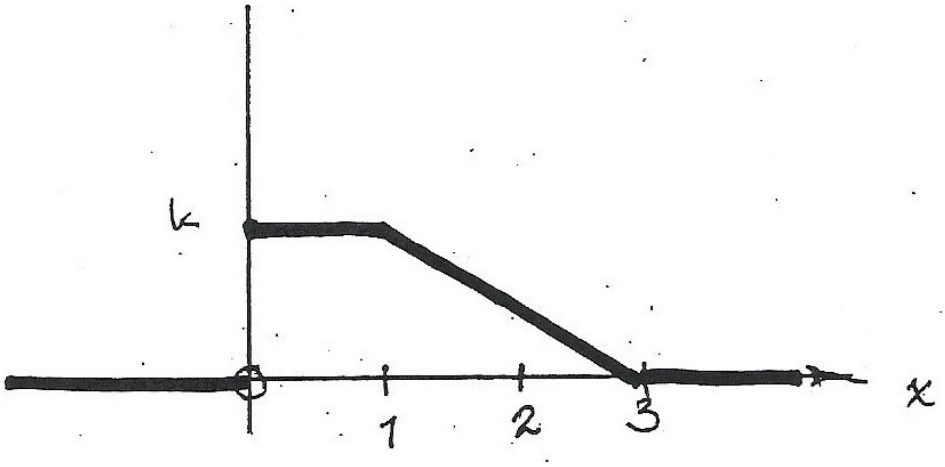
15. Sketch the graph of the PDF of a uniformly distributed random variable.

16. If X is a random variable which is uniformly distribute on $[-2,2] = \{x : -2 \le x \le 2\}$, then for $-2 \le x \le 2$, the CDF of X is

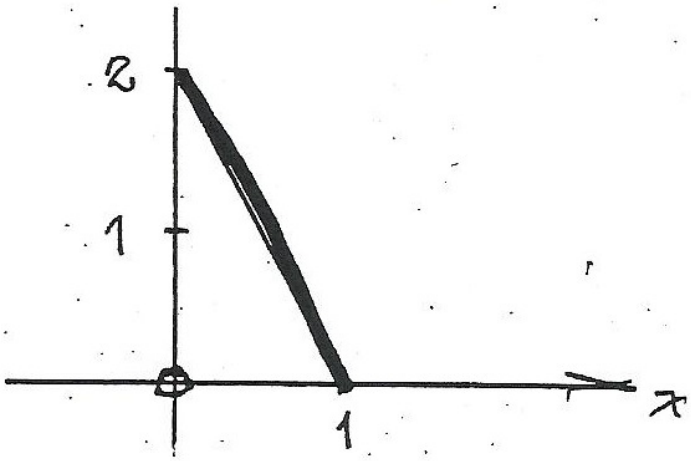
17. Suppose an insurance company sells an auto accident policy and determines the claims on this policy have an exponential distribution (PDF) $p(x) = 0.67e^{-0.67x}$ where x is measured in **thousands** of dollars. What is the **average** claim on this policy for someone who makes a claim?

18. Suppose X is normally distributed with mean 800 and standard deviation 150. We wish to calculate $P(600 \le X \le 900)$ by converting this to a z-score. Find a and b so that $P(a \le Z \le b) = P(600 \le X \le 900)$.

19. Suppose $p(x)$ is determined by the graph below. Find the value of k which makes $p(x)$ a PDF.



20. Suppose X is a random variable with PDF $p(x) = 2 - 2x$ on $0 \le x \le 1$. Find the mean of X.



21. For the graph in no. 20, find the $P(\frac{1}{3} \le X \le \frac{2}{3})$.

22. Suppose X is a random variable and its CDF is $F(x) = \begin{cases} 0, & x \le 0 \\ \frac{1}{2}x, & 0 \le x \le 2 \\ 1, & 2 \le x \end{cases}$

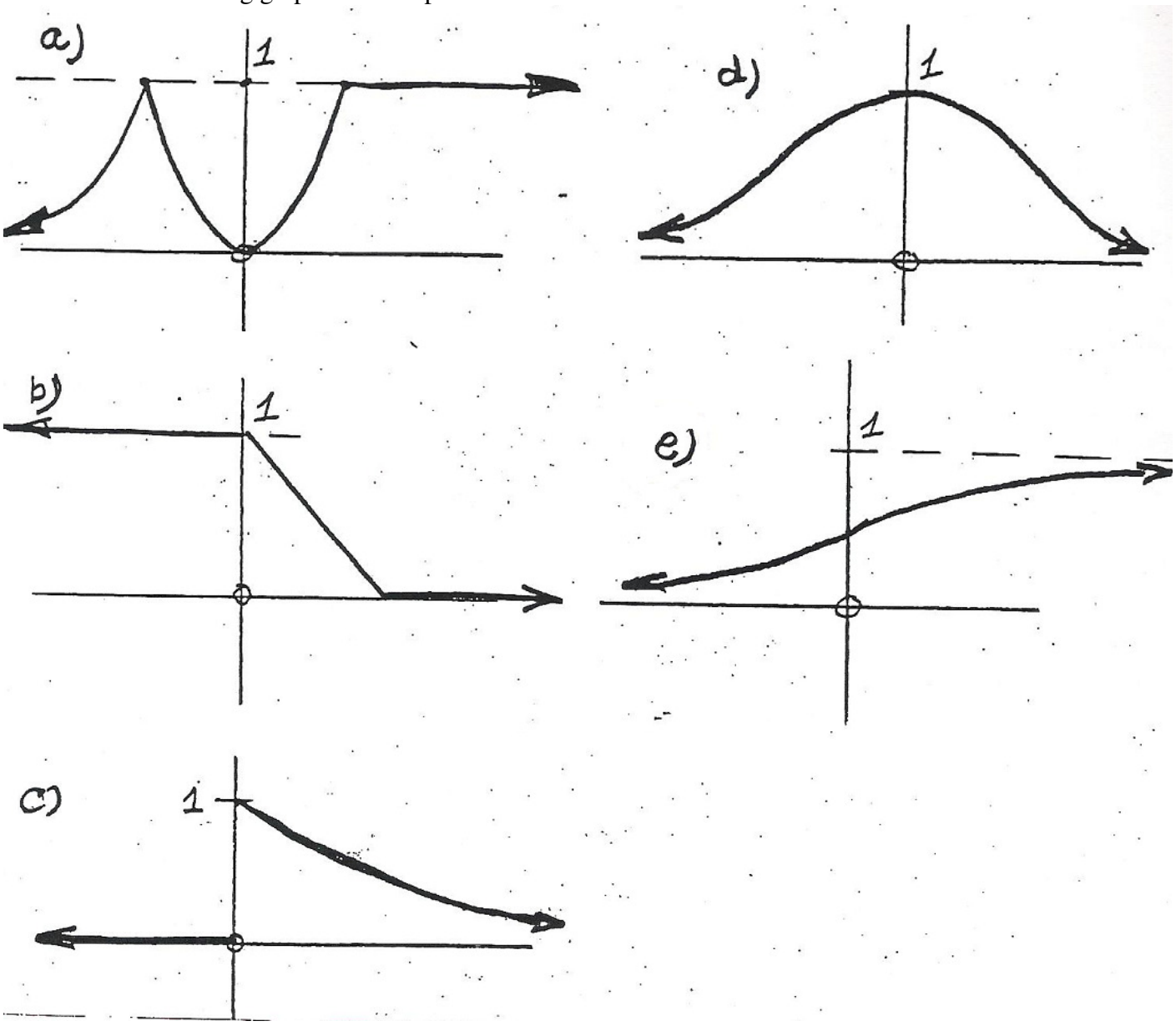
Then X is

23. Suppose a random variable has a CDF $F(x) = \begin{cases} 0, & x \le 0; \\ x^2, & 0 \le x \le 1; \\ 1, & 1 \le x \end{cases}$

Then the median of this random variable is

24. The mean of the random variable given in no. 23 is

25. Which of the following graphs could represent a CDF for a random variable?



26. Suppose $T = t$ is the time one waits in line for a bus each morning on the way to work. If your **median** waiting time is 5 minutes and T is exponentially distributed, then the PDF of T for $t \geq 0$ is

27. Suppose X is a random variable which has PDF $p(x) = 0.25e^{-0.25x}$ on $0 \leq x < \infty$. Calculate $P(X \geq 5)$

28. Let X be a random variable with PDF $p(x) = \frac{1}{2\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-3}{2}\right)^2}$ (i.e. X is normally distributed with mean 3 and standard deviation 2). Then, $P(2 \leq X \leq 3.5) = \frac{1}{2\sqrt{2\pi}} \int_2^{3.5} e^{-\frac{1}{2}\left(\frac{x-3}{2}\right)^2} dx$. If I wish to convert this integral to a z-score as $\frac{1}{\sqrt{2\pi}} \int_a^b e^{-\frac{z^2}{2}} dz$ then $a =$ _____ and $b =$ _____.