

Name: _____ Section Number: _____

TA Name: _____ Section Time: _____

Math 10C.
Midterm Exam 1
April 20, 2005

Turn off and put away your cell phone.

You may use a calculator, but no other electronic devices are allowed on this exam.

You may use one page of notes, but no books or other assistance on this exam.

Read each question carefully, answer each question completely, and show all of your work.

Write your solutions clearly and legibly; no credit will be given for illegible solutions.

If any question is not clear, ask for clarification.

1. (4 points) g is a function with continuous derivatives such that $g(0) = 3$, $g'(0) = -2$, and $g''(0) = 1$.

(a) What is the Taylor polynomial of degree 2 for g centered at $x = 0$?

- (b) The tangent line approximation for $g(-0.1)$ is $g(-0.1) \approx 3 + 0.2 = 3.2$. Find a better approximation for $g(-0.1)$.

| # | Score |
|----------|-------|
| 1 | |
| 2 | |
| 3 | |
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| Σ | |

2. (6 points) x measures the time (in seconds) that you must wait at a certain traffic signal for the red light to turn green. The probability density function for x is given by

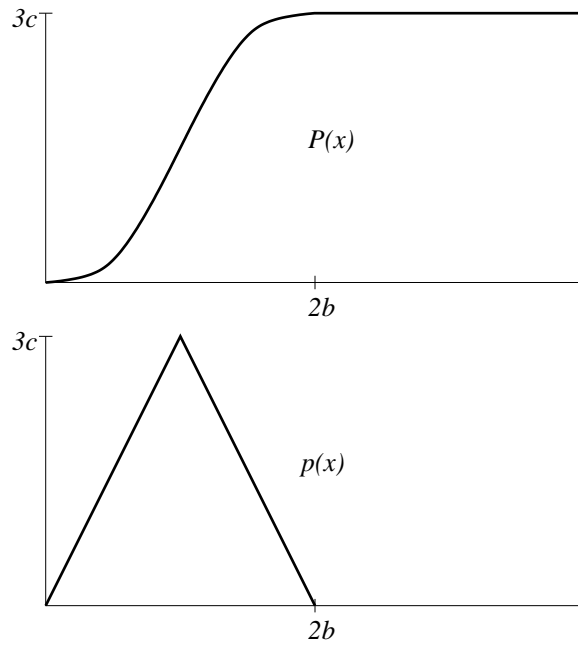
$$p(x) = \begin{cases} \frac{1}{40} & \text{if } 0 \leq x \leq 40, \\ 0 & \text{otherwise.} \end{cases}$$

- (a) What is the probability that you will have to wait at least 15 seconds for the red light to turn green?

- (b) What is the median wait time for the red light to turn green?

- (c) What is the mean wait time for the red light to turn green?

3. (4 points) The graphs of a cumulative distribution function $P(x)$ and its corresponding density function $p(x)$ are shown below.



- (a) Using the properties of a cumulative distribution function, determine the value of c .

- (b) Using the properties of a density function, determine the value of b .

4. (6 points) The *humidity* $I = f(T, h)$ is the perceived air temperature when the actual air temperature is T and the relative humidity is h . The following table of values for I is an excerpt from a table compiled by the National Oceanic and Atmospheric Administration.

| | | Relative humidity (%) | | | | | |
|------------------------------------|-----|-----------------------|-----|-----|-----|-----|-----|
| | | 20 | 30 | 40 | 50 | 60 | 70 |
| Actual temperature ($^{\circ}F$) | 80 | 77 | 78 | 79 | 81 | 82 | 83 |
| | 85 | 82 | 84 | 86 | 88 | 90 | 93 |
| | 90 | 87 | 90 | 93 | 96 | 100 | 103 |
| | 95 | 93 | 96 | 101 | 107 | 114 | 124 |
| | 100 | 99 | 104 | 110 | 120 | 132 | 144 |

- (a) What is the value of $I = f(95, 40)$?
- (b) When the actual temperature is $T = 85$, what is the relative humidity h at which the humidity $I = 90$?
- (c) When the relative humidity h is 50%, what is the actual temperature T at which the humidity $I = 88$?
- (d) Explain in words the meaning of the functions $p(h) = f(80, h)$ and $q(T) = f(T, 50)$.