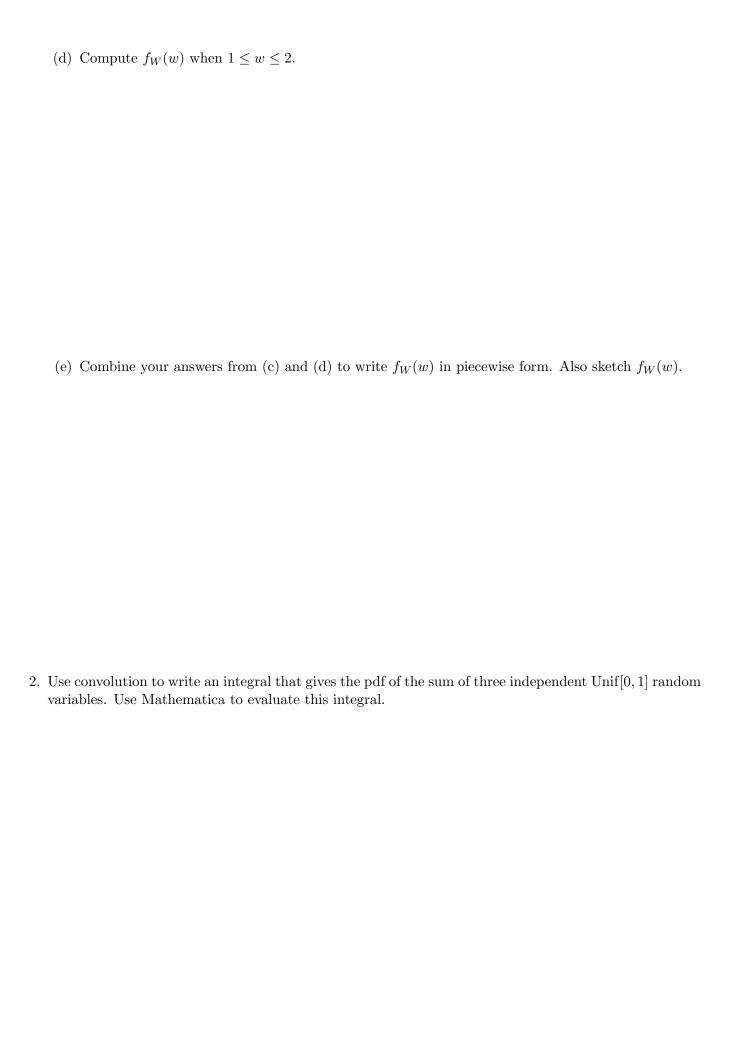
- 1. Let X and Y be independent uniform variables on [0,1], and let W=X+Y.
 - (a) What do you think the pdf of W will look like? Make a guess. Draw a sketch.

(b) Write down the convolution integral formula for the pdf of W. For what values of x is the integrand nonzero?

(c) Compute $f_W(w)$ when $0 \le w \le 1$.



Use moment generating functions for the following problems.

mgf reference:

Normal: $e^{\mu t + \sigma^2 t^2/2}$

Geometric: $\frac{pe^t}{1-(1-p)e^t}$

- Exponential: $\frac{\lambda}{\lambda t}$ Gamma: $\left(\frac{1}{1 \beta t}\right)^{\alpha}$ Negative Binomial: $\left(\frac{pe^t}{1 (1 p)e^t}\right)^r$
- 3. Let $X_k \sim N(k,1)$ for $k \in \{1,2,\ldots,m\}$, and suppose all of the X_k are independent.
 - (a) What is the distribution of $X_1 + X_2 + \cdots + X_m$?

(b) What is the distribution of $X_1 + 2X_2 + 3X_3 + \cdots + mX_m$?

4. Use moment generating functions to justify the following statements
 4. Use moment generating functions to justify the following statements. (a) The sum of n independent exponential random variables with common parameter λ has a gamma
distribution with parameters $\alpha = n$ and $\beta = 1/\lambda$.
(b) The sum of n independent geometric random variables with common parameter p has a negative binomial distribution with parameters $r = n$ and p .