$\infty$ 

7. [8 points] Suppose F is a nonnegative function defined for all real numbers x. Below are properties of F. Circle **all** that apply to F based on the fact it has this property.

a. [2 points] 
$$\int_{-\infty} F(x)dx = 1$$
.  
(A)  $F$  could be a PDF.  
(B)  $F$  could be a CDF.  
(C)  $F$  is definitely not a PDF or a CDF.  
b. [2 points]  $\lim_{x\to\infty} F(x) = 1$  and  $F(2) < F(1)$ .  
(A)  $F$  could be a PDF.  
(B)  $F$  could be a CDF.  
(C)  $F$  is definitely not a PDF or a CDF.  
(C)  $F$  is definitely not a PDF or a CDF.  
c. [2 points]  $F'(x) > 0$  for  $x \ge 0$ .

(A) F could be a PDF.

(B) F could be a CDF.

(C) F is definitely not a PDF or a CDF.

**d**. [2 points] F(7) = 2.

(A) F could be a PDF.

- (B) F could be a CDF.
- (C) F is definitely not a PDF or a CDF.
- 8. [9 points] The parts of this problem are unrelated.
  - **a**. [4 points] Let  $\sum_{n=1}^{n} a_n$  be a geometric series with  $a_3 = 54$  and  $a_6 = -2$ . Write a general formula for  $a_n$ :

Solution: Since  $a_n$  are the terms of a geometric series,  $a_3 = ab^3$  and  $a_6 = ab^6$  for some a, b that we want to solve for. To solve for b:

$$\frac{a_6}{a_3} = \frac{-2}{54} = -\frac{1}{27} = b^3$$

So,  $b = \frac{-1}{3}$ . Now, to solve for *a*:

$$a_3 = 54 = a\left(\frac{-1}{3}\right)^3 = \frac{-a}{27}$$

So, a = -27 \* 54. This gives a general formula for  $a_n = -27 * 54 \left(\frac{-1}{3}\right)^n$ **b**. [5 points] Let  $b_n = \frac{n}{n+1}$  and  $s_n = \sum_{i=1}^n b_i$ . Circle all statements which are true.

- (A) The sequence  $b_n$  is bounded.
- (B) The sequence  $b_n$  is monotone.
- (D) The sequence  $s_n$  is bounded.
- (E) The sequence  $s_n$  is monotone.
- (C)  $\lim_{n \to \infty} b_n$  exists. (F)  $\lim_{n \to \infty} s_n$  exists.