

# CSE 254: Problem Set One

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## 1 Exercise 1

Show that:  $\sum_{i=1}^n i \cdot 2^i = (n-1) \cdot 2^{n+1} + 2$ .

## 2 Exercise 2

The Fibonacci numbers  $F_0, F_1, F_2, \dots$  are defined as follows (this is a definition by induction):  $F_0 = 0, F_1 = 1, F_{n+2} = F_{n+1} + F_n$  for  $n = 0, 1, 2, \dots$ . Prove that for any  $n \geq 0$  we have that  $F_n \leq ((1 + \sqrt{5})/2)^{n-1}$ . (Note,  $F_n$  is the  $n$ 'th Fibonacci number and the  $\frac{1+\sqrt{5}}{2}$  is the number  $\phi$ , the "golden ratio.")