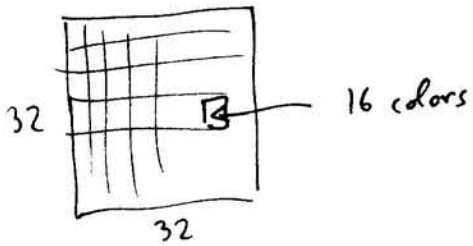


Problem 1



how many different icons?

$$16^{32 \times 32} = 16^{1024} \equiv 10^x$$

$$x = \log_{10} (16^{1024}) = \frac{\ln 16}{\ln 10} \underbrace{\log_{16} (16^{1024})}_{1024}$$

$$= 1233.0$$

Note:
 $\log_a x = \frac{\ln x}{\ln a}$
 change of basis

\Rightarrow how many different icons in decimal units: 10^{1233}
 (1233 zeros!)

"one in a million" $\rightarrow 10^{1227}$ useful ones

100 pixels per inch \Rightarrow 1 inch holds $\left(\frac{100}{32}\right)^2 \approx 10$ icons

\Rightarrow area $\approx 10^{1226}$ squ. inch

$\approx 6.5 \cdot 10^{1216}$ squ. km

$\approx 6 \cdot 10^{1190}$ squ. light years

$\approx 6 \cdot 10^{1170}$ squ. universes

$$\text{one } 8 \times 10 \text{ holds } \text{floor} \left(\frac{800}{32} \right) \times \text{floor} \left(\frac{100}{32} \right)$$

$$= 25 \times 31$$

$$= 775 \text{ full icons}$$

$$\frac{10^{1227}}{775} \text{ pages} \approx 1.3 \cdot 10^{1224} \text{ pages}$$

(each 0.01 thick)

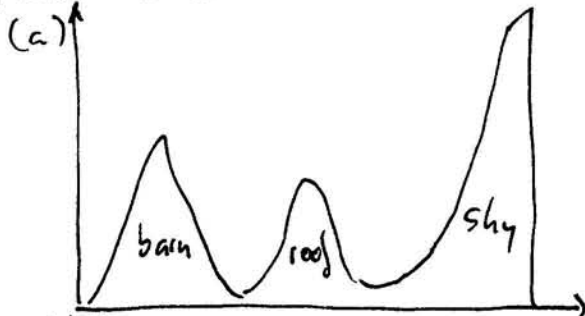
$$\Rightarrow 1.3 \cdot 10^{1222} \text{ inches} \approx$$

$$3.3 \cdot 10^{1217} \text{ km}$$

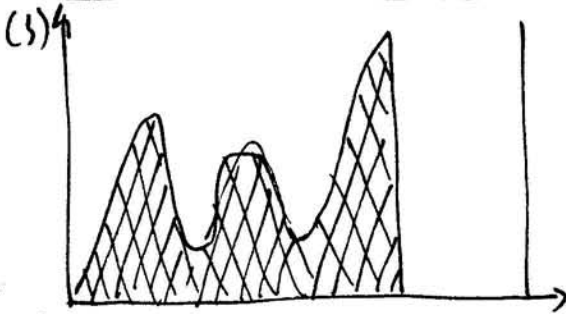
$$3.1 \cdot 10^{1204} \text{ light years}$$

$$3.1 \cdot 10^{1194} \text{ universes}$$

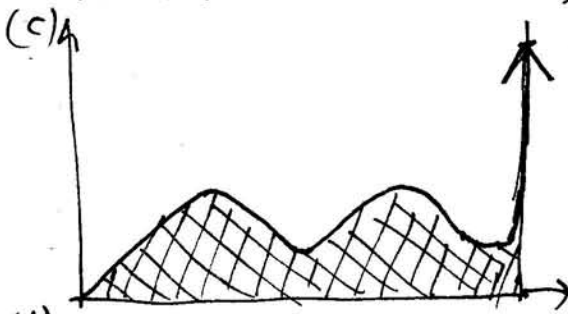
Problem 2



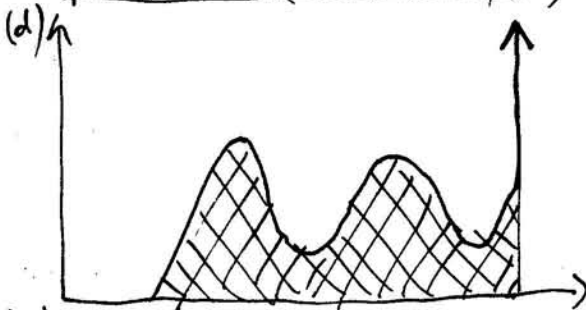
properly digitized



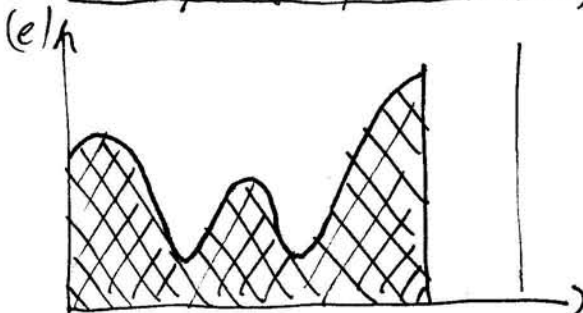
gain too low



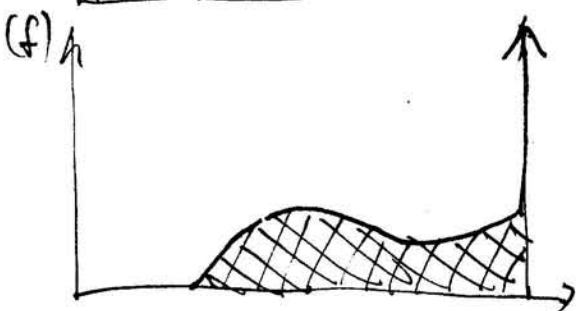
gain too high



too much offset



too little offset



too much gain & offset