

1. 80 minutes

$$a) 8,000 \text{ Hz}, 8 \text{ bit/sample}, 64,000 \text{ bits/second} \cdot \frac{60 \text{ sec}}{1 \text{ min}}, 80 \text{ min} \\ = 307,200,000 \text{ bits or } 38.4 \text{ MB.}$$

$$b) 44,100 \text{ Hz}, 16 \text{ bits} \cdot \frac{44,100 \text{ sam}}{\text{Sample}} \cdot \frac{60 \text{ sec}}{\text{Seconds}} \cdot 80 \text{ min} \cdot 2 \text{ tracks} \\ = 677,376,000 \text{ bits, or } 847 \text{ MB.}$$

$$c) 338,688,000 \text{ bits, or } 42 \text{ MB.}$$

$$d) 640 \times 480 = 307,200 \text{ samples, } 1.06 \times 10^{12} \text{ bits of video} + 307 \text{ Mbits audio} \\ = 1.06 \times 10^{12} \text{ or } 132 \text{ GB.}$$

$$4. \cos(A) \cos(B) \quad \text{Euler's Identity: } e^{j\theta} = \cos(\theta) + j\sin(\theta) \\ \cos(\theta) = \frac{e^{j\theta} + e^{-j\theta}}{2} \\ = (e^{jA} - j\sin(A))(e^{jB} - j\sin(B)) \quad \sin(\theta) = \cos(\theta - \pi/2) \\ = (e^{jA} - j\cos(A - \pi/2))(e^{jB} - j\cos(B - \pi/2))$$

$$6. x(t) = \sin(2\pi t + \theta)$$

$$\theta = 0, x(t) \text{ odd}$$

$$\theta = \pi/2, x(t) \text{ even}$$

$$\sin(2\pi t) \Rightarrow \text{graph of a sine wave}$$