

Quiz 1

Name \_\_\_\_\_

(1) 1 mi is equivalent to 1609 m so 55 mph is:

- A) 15 m/s B) 25 m/s C) 66 m/s D) 88 m/s (E) 1500 m/s

$$\begin{aligned} & (55 \text{ mi/hr}) \left( \frac{1609 \text{ m}}{\text{mi}} \right) \left( \frac{1 \text{ hr}}{60 \text{ min.}} \right) \left( \frac{1 \text{ min}}{60 \text{ sec}} \right) \\ & = 24.6 \text{ m/s} \approx 25 \text{ m/s} \end{aligned}$$

(2) Suppose  $A = B^n C^m$ , where  $A$  has dimensions  $LT$ ,  $B$  has dimensions  $L^2 T^{-1}$ , and  $C$  has dimensions  $LT^2$ . Then the exponents  $n$  and  $m$  have the values:

- A) 2/3; 1/3 B) 2; 3 C) 4/2; -1/5 (D) 1/5; 3/5 E) 1/2; 1/2

$$\begin{aligned} [L][T] &= ([L]^2 [T]^{-1})^n ([L][T]^2)^m \\ &= [L]^{2n+m} [T]^{-n+2m} \end{aligned}$$

$$\begin{aligned} 1 &= 2n+m \\ 1 &= -n+2m \end{aligned} \rightarrow \begin{aligned} 1 &= 2n+m \\ 2 &= -2n+4m \end{aligned} \rightarrow \begin{aligned} 3 &= 5m \\ m &= 3/5 \end{aligned}$$

(3) The coordinate of an object is given as a function of time by  $x = 4t - 3t^2$ , where  $x$  is in meters and  $t$  is in seconds. Its average velocity over the interval from  $t = 0$  to  $t = 2$  s is:

- A) 0 m/s B) -2 m/s (C) 2 m/s D) -14 m/s E) can not be computed

$$\begin{aligned} 1 &= 2n + 3/5 \\ n &= \frac{1 - 3/5}{2} \\ &= \frac{1}{5} \end{aligned}$$

$$V_{\text{avg}} = \frac{\Delta x}{\Delta t} = \frac{x(2) - x(0)}{2 - 0} = \frac{-4 \text{ m}}{2 \text{ s}} = -2 \text{ m/s}$$

$$\begin{cases} x(2) = 4(2) - 3(2)^2 = 8 - 12 = -4 \\ x(0) = 4(0) - 3(0)^2 = 0 \end{cases}$$