

# ENERGY-WORK-POWER

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New York Times , March 10, 2016 by Tom Voelk . Dedicated to my wife Gertrudes C. Cabacuncan, born March 15, 1938.

## The BMW 750i xDrive, Tranquillity With a Touch of Vegas



**INTRODUCTION:** Turbo charged engines are a bit more efficient ( > 40 %) compared to standard engines (~15-20% efficient.) . X = efficiency,

$$P_{\text{OUT}} = X P_{\text{INPUT}} = W_{\text{OUT}} / t = [1/2 m v^2] / t \quad \text{eq. 1}$$

$W_{\text{OUTPUT}}$  work of engine goes into Kinetic energy ( $K = \frac{1}{2} m v^2$ ) of car. At BMW site this BMW 750i x Drive is stated as having **445 HP.**

**HINTS:** 550 ft. lb./s = 1 HP, 60 mph = 88 ft./s.,  
weight = m g , g = 32 ft./s<sup>2</sup>

The sixth generation BMW 7 Series has **carbon-fiber construction** and is packed with high technology. Most people, however, will simply appreciate the sedan for its serene ride. The new [2016 BMW 750i xDrive](#) folds an entire Best Buy of technology into a sedan and then takes on Boeing for good measure with a **carbon-fiber-rich chassis that reduces weight by 190 pounds.**

The 750i tranquilly runs with a 4.4-liter, 8-cylinder engine with **(((two twin-scroll turbos tucked in the V. Rich torque helps usher the car from rest to 60 miles an hour in 4.3 seconds)))**.

Using GPS, electromechanical dampers and adjustable antiroll bars, BMW's adaptive suspension provides a serene ride quality. Agility is courtesy of all-wheel steering and the expected BMW chassis tuning.

In sport mode, the car feels as if half a ton has been lifted from its **(((4,600-pound mass)))**, but the sixth-generation 7 Series is no M3, nor is it meant to be one. Starting at \$82,295 for a 740i (\$129,245 as driven), this stealth luxury ride has a polish and depth that demand time to truly grasp.

**QUESTIONS:** (a) Find mass of this car in units of slugs? , (b) Convert 440 HP to ft. lb./s. ? (c) Find efficiency X of this BMW 750i x Drive twin-scroll turbo engine?

**ANSWERS:** (a) 143.75 slugs, (b) 244,750 ft. lb./s, (c) X = ~ 52.9 % efficient

**EDITORS NOTE:** This efficiency seems a bit high, but the new 2016 German cars are becoming more and more efficient. This is a twin-turbo with a very efficient transmission. WE would expect a turbo engine to obtain >40 % efficiency, but this being a BMW we expect even better efficiency and BMW seems to have achieved it. JC