Homework: Vehicle Models

20.1–20.6

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The car I chose for this problem set is a 2005 Chevrolet Corvette C6 Z06. This is a 6-speed manual transmission car with a 427.8 in^3 V8 engine. An example of this car is shown in Figure 1.

Figure 1: A 2005 Chevrolet Corvette C6 Z06 racing at the Motor Speedway of the South in the 2005 Piston Cup final.

20.1

The following are specifications for the vehicle:

a. Final drive axle ratio: 3.42:1
b. 1st gear ratio: 2.66:1
c. 6th gear ratio: 0.5:1
d. Tire specification: P275/35ZR18 (front), P325/30ZR19 (rear)
e. Base curb weight: 3132 lb

20.2

Given that the vehicle speed is related to engine speed as in Equation 1, where r is the tire radius and N_{ft} is the final transmission gear ratio, the vehicle cruising at 30 m/s in 6th gear has an engine speed of $1539/\pi r$ m/s (the final gear ratio is $0.5 \times 3.42 = 1.71$).

$$v = \frac{\pi r}{30 N_{\text{ft}}} \omega \tag{1}$$

Since this is a rear-wheel drive car, the rear tire radius will be used for r. This is $19"/2 + 0.3 \times 325$ mm $= 0.339$ m. The engine speed is therefore $1539/0.339\pi = 1446$ rad/s.