#14 (p. 133)

a) If gasoline refineries are operating at near full capacity, supply is likely to be highly inelastic.
b) The burden of a tax falls on the side of the market that is relatively more inelastic. Thus it will be suppliers who will benefit from the temporary suspension of the federal gasoline tax.

#12 (p. 175)

"Suppose that a differentiable function f achieves a maximum at x*. Then we know from elementary calculus that the first derivative of f must be equal to zero at x* and that the second derivative of f must be less than or equal to zero at x*. These conditions are known as the first order condition and the second order condition, respectively, and they can be expressed mathematically by:"

$$\boldsymbol{f'(x^*) = 0}$$

$$\boldsymbol{f''(x^*) \leq 0}$$

We can apply the first second order conditions to our tax problem in the following way:

The tax which gives the government max revenues is $150.

The original tax revenue equation (our objective function) is:

$$Tax\ Rev = 200T - \left(\frac{2}{3}\right)T^2$$

a) First Order Condition (FOC) for a Maximum:

Take the first derivative of our tax revenue function with respect to T to find the slope and then set it equal to zero to find the point where the slope is zero.

$$\frac{dTax\ Rev}{dT} = 200 - \left(\frac{4}{3}\right)T = 0$$

We next solve for T to find a maximum point:

$$T = 200 * \left(\frac{3}{4}\right) = \$150$$

Is T=$150 a global maximum or a local maximum?

b) Second Order Condition (SOC) for a Maximum:

Take the second derivative and make sure it is negative or equal to zero at $150.

$$\frac{d^2 Tax\ Rev}{d^2 T} = -\frac{4}{3} \leq 0$$

Therefore T= $150 is a maximum.