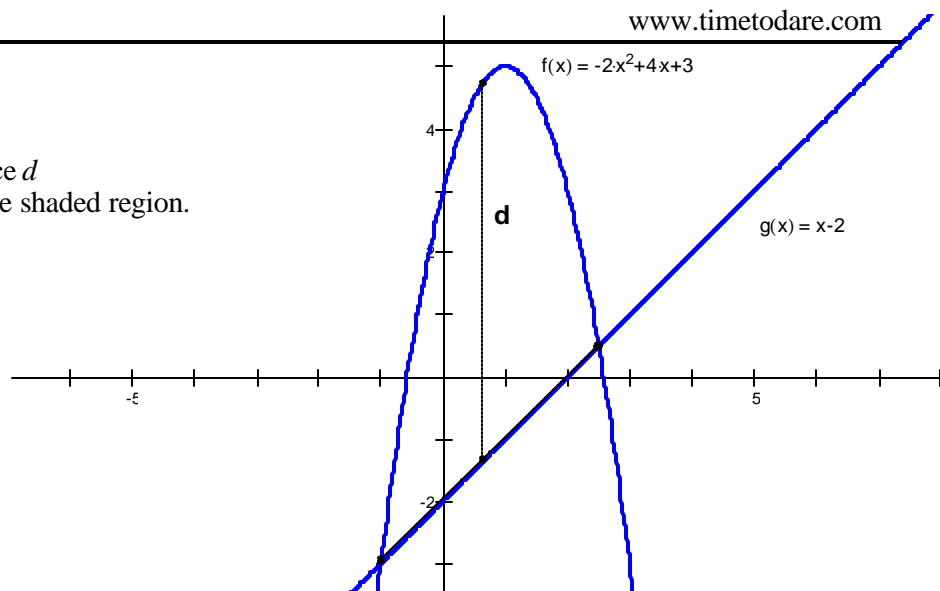


## Section 2.6 - Exercises

**#35** Find the maximum vertical distance  $d$  between the parabola and the line for the shaded region.  
(A: 6.125)



**#40** The number of miles  $M$  that a certain automobile can travel on one gallon of gasoline at a speed of  $v$  mi/hr is given by

$$M = -\frac{1}{30}v^2 + \frac{5}{2}v \quad \text{for } 0 < v < 70.$$

- a) Find the most economical speed for a trip. (A: 37.5 mi/hr)  
b) Find the largest value of  $M$ . (A: 46.875 mi/gal)

**#42** An object is projected vertically upward with an initial velocity of  $v_0$  ft/sec, and its distance  $s(t)$  in feet above the ground after  $t$  seconds is given by the formula  $s(t) = -16t^2 + v_0t$ .

- a) If the object hits the ground after 12 seconds, find its initial velocity. (A: 192 ft/sec)  
b) Find its maximum distance above the ground. (A: 576 ft)

**#50** Traffic engineers are designing a stretch of highway that will connect a horizontal highway with one having a 20% grade (what is the slope?). The smooth transition is to take place over a horizontal distance of 800 feet, with a parabolic piece of highway used to connect points  $A$  and  $B$ . If the equation of the parabolic segment is of the form  $y = ax^2 + bx + c$ , it can be shown that the slope of the tangent line at the point  $P(x, y)$  on the parabola is given by  $m = 2ax + b$ .

- a) Find an equation of the parabola passes through  $A$  and  $B$  - that is, the parabola that has a tangent line of slope 0 at  $A$  and  $\frac{1}{5}$  at  $B$ . (A:  $y = \frac{1}{8000}x^2$ )  
b) Find the coordinates of  $B$ . (A: (800, 80))

**#51** A doorway has the shape of a parabolic arch and is 9 feet high at the center and 6 feet wide at the base. If a rectangular box 8 feet high must fit through the doorway, what is the maximum width the box can have? (A: 2 ft)

**#54** A travel agency offers group tours at a rate of \$60 per person for the first 30 participants. For larger groups - up to 90 - each person receives a \$0.50 discount for every participant in excess of 30. For example, if 31 people participate, then the cost per person is \$59.50. Determine the size of the group that will produce the maximum amount of money for the agency. (A: 75)