

$$3. F(x) = 4(3x^2 - 7x + 5)^4 \quad 4. G(t) = \frac{\sqrt{1-2t}}{4-7t^2}$$

$$5. h(t) = 12t^{-1} - 4\sqrt{17}$$

$$6. e(t) = (5t^2 - 3t + 2)^{-1}(4t - 3)^2$$

$$7. e(t) = \frac{(4t-3)^2}{\sqrt[3]{5t^2-3t+2}} \quad \text{HINT: Note Prob. 6.}$$

$$8. f(x) = \frac{x}{\sqrt{3-5x}}$$

$$9. v(x) = 11(4x-7)^{1/2} + \sqrt{\pi^2-5}$$

$$10. u(x) = 21\sqrt{17}(4x-3)^{-1} + \frac{7x}{(x-1)^2} + 91\sqrt{17}\pi$$

11. A tin cylindrical can is to be constructed to contain 125 cu in. Determine the dimensions of a can requiring the least total sheet metal to construct if the circular top and bottom are cut from square pieces of tin with the scraps wasted and the side is cut from a large sheet without waste.

12. A voltaic cell has constant emf and constant internal resistance r . The work done by this cell in sending a steady current through an external circuit of resistance x is given by

$$W = \frac{kx}{(x+r)^2} = kx(x+r)^{-2}$$

where k and r are constants. For what value of x is W a maximum?

13. John Garnett has the monopoly of the sale of student pins, which cost him \$3 each. If the number sold varies inversely as the cube of the selling price, what selling price will yield the greatest total profit to John?

14. Determine intervals in which $y = (x+6)(x-1)^2$ is increasing as x increases.

15. The weight W of hot gas passing up a chimney in a given time is given by

$$W = \frac{k\sqrt{0.96T - T_0}}{T}$$

where T denotes the (variable) temperature of the gas, T_0 is the constant temperature of the outside air, and k is a constant. What value of T will force a maximum weight of gas through the chimney in the given time interval?

16. An electron moves on the path $y = x^2 - \frac{2}{3}$. At what position is the electron nearest the origin? What is this minimum distance?

17. An electron travels along the path represented by $x^2 = y$. How close does the electron come to an accelerator placed at $(3,0)$?

18. A particle travels along the curve $xy = 5$. How close does it come to the point $(3,0)$?

19. Find the minimum cost of the material for a box with a square base which contains 16 cu ft if the material for the top and bottom costs \$2 per square foot and that for the sides costs \$1 per square foot.

20. (a) What is the smallest number which can be found by adding a positive number to its reciprocal?

(b) Rework (a) without the restriction to "positive" numbers.

21. Find the dimensions of the cylinder of largest volume which can be inscribed in a right circular cone of height 24 in. and radius of the base 8 in.

22. Find the volume of the largest right circular cylinder which can be inscribed in a sphere of radius 24 in.

23. A sheet of paper is to contain 18 sq in. of sensitized emulsion. The margins at the top and bottom of the emulsion are to be 2 in. each and a 1-in. margin is to be maintained at each side of the emulsion. Find the dimensions of the smallest piece of paper which can be used.

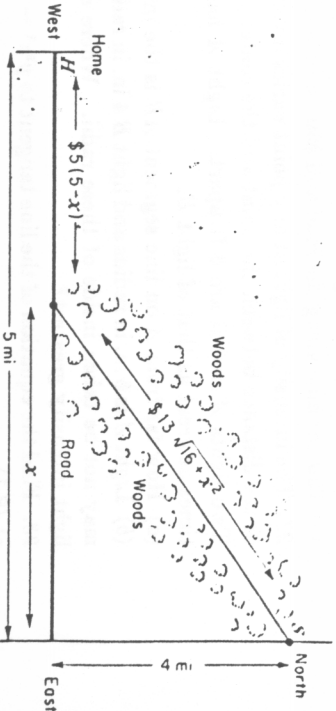


Figure 5-1

24. John wishes to run a telephone line from his home to a point 5 miles east and 4 miles north of his home (Fig. 5-1). A road running EW passes his home. Along the road the line costs \$5 per