top (Fig. 4-21). Determine the dimensions of the box of largest volume which may be so formed.

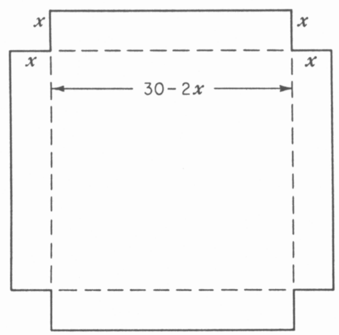

Figure 4-21

In Probs. 27 to 35, sketch the indicated loci, showing all maximum and minimum points. Determine rough approximations of the Y coordinates, not exact values, if desired.

27. $y = 7(2x - 3)^5(x^2 - 3x + 7)^9$.

28. $y = \dfrac{3x^2 - 5x + 7}{x}$.

(*a*) Work as $u \cdot v$ with $u = 3x^2 - 5x + 7$ and $v = 1/x$.

(*b*) Work as $y = 3x - 5 + (7/x)$.

29. $y = (479x^2 - 375x + 2{,}193)^{71}$.

30. $y = \pi x^2 - \sqrt{2}\,(x) + 37 - 5\sqrt{17}$.

31. $y = 71(x - 5x^3)^{14}$.

32. $y = 2 + |3x - 15|$.

33. $y = (4x - 2)^5x^2$.

34. $y = 1/x + 1/x^2 - 4x^3$.

35. $y = \begin{cases} 4x - 7 & \text{if } x \geqq 3. \\ 8 - x & \text{if } x < 3. \end{cases}$

4-12. Self-test

1. Use the basic definition (delta process) to determine $\dfrac{dy}{dx}$ when $y = \frac{3}{2}x + 1$.

2. Determine the equation of a line tangent to the curve $y = x^3 + x^2 - 30x + 5$ such that the tangent line has slope 3.

3. Sketch $y = 4x^3 - 2x^2 - 40x + 3$, showing all maximum and minimum points as well as the approximate intercepts.

4. If $y = (x^2 - 4x + 2)^{15} \cdot (2x - 3)^{10}$, find $\dfrac{dy}{dx}$.

5. A stone is projected upward from a tower 144 ft above ground level with an initial velocity of 32 ft/sec upward. Determine the highest point to which the stone ascends and also determine the velocity of the stone as it strikes the ground. (See Prob. 16, page 134.)

6. A square sheet of metal 40 in. on each side has square pieces removed from each corner and the remaining edges turned up to form a box with an open top. Determine the dimension of the box of largest volume which may be so formed.

7. Find the point on the graph $y = x^2$ which is closest to the point $(3, -1)$. Obtain your answer to the nearest tenth only.