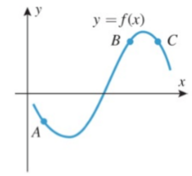
Section 4.1: Analysis of Functions 1: Increase, Decrease, & Concavity

3. Use the graph of the equation y=f(x) in the accompanying figure to find the signs of dy/dx and d^2y/dx^2 at the points A, B, and C.



Find: (a) the intervals on which *f* is increasing, (b) the intervals on which *f* is decreasing, (c) the open intervals on which *f* is concave up, (d) the open intervals on which *f* is concave down, and (e) the x-coordinates of all inflection points.

17. $f(x) = (2x+1)^3$

21. $f(x) = \frac{x-2}{(x^2-x+1)^2}$

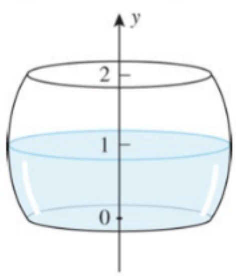
23. $f(x) = \sqrt[3]{x^2+x+1}$

27. $f(x) = e^{-x^2/2}$

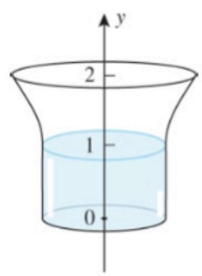
33. $f(x) = \sin x - \cos x\,; [-\pi, \pi]$

63-66. Suppose that water is flowing at a constant rate into the container shown. Make a rough sketch of the water level *y* versus the time *t*. Make sure that your sketch conveys where the graph is concave up and concave down, and label the y-coordinates of the inflection points. (See Example on P239)

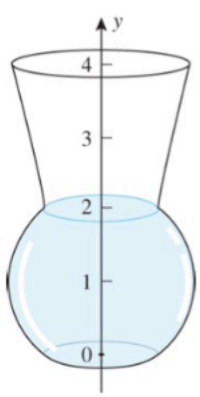
63.



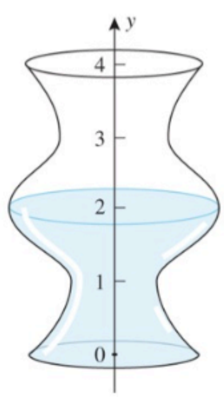
64.



65.



66.



69. Suppose that the spread of a flue virus on a college campus is modeled by the function $y(t) = \frac{1000}{1+999e^{-0.9t}}$ where y(t) is the number of infected sutdents at time *t* (in days, starting with t=0). Use a graphing utility to estimate the day on which the firus is spreading the most rapidly.