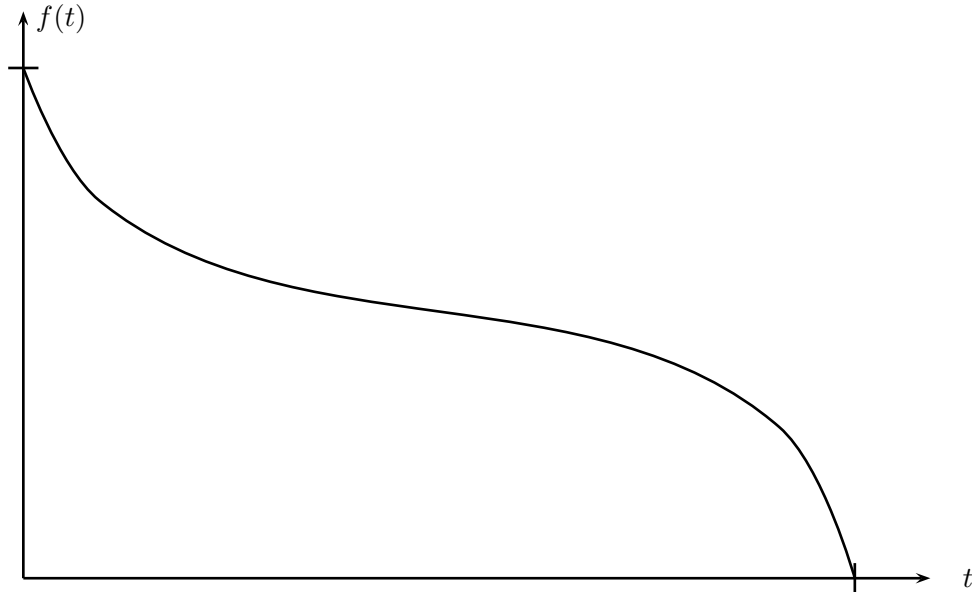


5. The graph below shows an approximation to the stock price,  $P = f(t)$  in dollars, of Lehman Brothers Inc. (LEH) with  $t$  measured in months since the stock's highest point in February 2007 to the company's ultimate bankruptcy in September 2008 ( $t=19$ ).



- (a) (2 points) Explain why  $f$  is invertible on the indicated domain.

$f$  is invertible on its domain because for each output there is a unique input. Graphically, this is best seen by the fact that the graph passes the horizontal line test.

- (b) (3 points) Interpret, in the context of this problem,  $f^{-1}(5)$ .

$f^{-1}(5)$  is the number of months (since Feb 2007) it took for LEH's stock price to reach \$5.

- (c) (4 points) If  $\frac{dP}{dt}|_{t=16} = -5$  and  $f(16) = 25$ , find an equation of the line tangent to the curve at  $t = 16$ .

Since we are given the slope and a point, we can use the point-slope equation. Thus, our tangent line equation is  $y - 25 = -5(t - 16)$ , or equivalently  $y = -5t + 105$ .

- (d) (3 points) Using part (c), what month would your tangent line have predicted LEH's stock price would reach zero?

We need to know what  $t$  value yields  $y = 0$ . From part (c), we get the equation  $-25 = -5t + 80$ , which has the solution  $t = 21$ . Now, since  $t$  was measured in months since Feb 2007,  $t = 21$  corresponds to November 2008 (Lehman actually filed for bankruptcy in September of 2008).