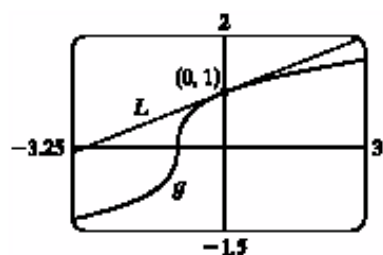


6.  $g(x) = \sqrt[3]{1+x} = (1+x)^{1/3} \Rightarrow g'(x) = \frac{1}{3}(1+x)^{-2/3}$ , so  $g(0) = 1$  and  $g'(0) = \frac{1}{3}$ . Therefore,  $\sqrt[3]{1+x} = g(x) \approx g(0) + g'(0)(x-0) = 1 + \frac{1}{3}x$ .  
 So  $\sqrt[3]{0.95} = \sqrt[3]{1+(-0.05)} \approx 1 + \frac{1}{3}(-0.05) = 0.98\bar{3}$ ,  
 and  $\sqrt[3]{1.1} = \sqrt[3]{1+0.1} \approx 1 + \frac{1}{3}(0.1) = 1.0\bar{3}$ .



12.  $y = f(x) = \sqrt{x} \Rightarrow dy = \frac{1}{2\sqrt{x}} dx$ . When  $x = 100$  and  $dx = -0.2$ ,  $dy = \frac{1}{2\sqrt{100}}(-0.2) = -0.01$ , so  $\sqrt{99.8} = f(99.8) \approx f(100) + dy = 10 - 0.01 = 9.99$ .
14. To estimate  $1/1002$ , we'll find the linearization of  $f(x) = 1/x$  at  $a = 1000$ . Since  $f'(x) = -1/x^2$ ,  $f(1000) = 0.001$ , and  $f'(1000) = -0.000001$ , we have  $L(x) = 0.001 - 0.000001(x - 1000) = -0.000001x + 0.002$ . Thus,  $1/x \approx -0.000001x + 0.002$  when  $x$  is near 1000, so  $1/1002 \approx -0.000001(1002) + 0.002 = 0.000998$ .
25.  $F = kR^4 \Rightarrow dF = 4kR^3 dR \Rightarrow \frac{dF}{F} = \frac{4kR^3 dR}{kR^4} = 4\left(\frac{dR}{R}\right)$ . Thus, the relative change in  $F$  is about 4 times the relative change in  $R$ . So a 5% increase in the radius corresponds to a 20% increase in blood flow.
27. (a) The graph shows that  $f'(1) = 2$ , so  $L(x) = f(1) + f'(1)(x-1) = 5 + 2(x-1) = 2x + 3$ .  
 $f(0.9) \approx L(0.9) = 4.8$  and  $f(1.1) \approx L(1.1) = 5.2$ .
- (b) From the graph, we see that  $f'(x)$  is positive and decreasing. This means that the slopes of the tangent lines are positive, but the tangents are becoming less steep. So the tangent lines lie *above* the curve. Thus, the estimates in part (a) are too large.