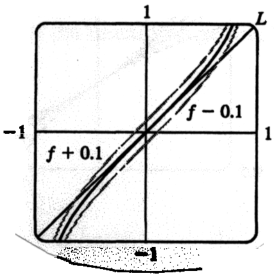
Math 1A Fall 2001: Section 3.8 Solutions

2. $f(x) = \ln x \quad \Rightarrow \quad f'(x) = 1/x$, so $f(1) = 0$ and $f'(1) = 1$.
Thus, $L(x) = f(1) + f'(1)(x-1) = 0 + 1(x-1) = x - 1$.

8. $f(x) = \tan x \quad \Rightarrow \quad f'(x) = \sec^2 x$, so $f(0) = 0$ and $f'(0) = 1$.
Thus, $f(x) \approx f(0) + f'(0)(x-0) = 0 + 1(x-0) = x$.
We need $\tan x - 0.1 < x < \tan x + 0.1$, which is true when $-0.63 < x < 0.63$.



12. If $y = x^6$, $y' = 6x^5$ and the tangent line approximation at $(1, 1)$ has slope 6. If the change in x is 0.01, the change in y on the tangent line is 0.06, and approximating $(1.01)^6$ with 1.06 is reasonable.

16. (a) The linear approximation of f at $a = 1$ is
$f(x) \approx f(1) + f'(1)(x-1) = 2 + \sqrt{1^3+1}\,(x-1) = 2 + \sqrt{2}\,(x-1)$. So at $x = 1.1$,
$f(x) \approx 2 + 0.1\sqrt{2} \approx 2.1414$.

(b) The true value of $f(1.1)$ is greater than the linear estimate, since the derivative of the function is getting larger while the derivative of the approximation is constant.

18. (a) $y = \sqrt{x} \quad \Rightarrow \quad dy = \frac{1}{2}$

(b) $x = 1$ and $dx = 1 \quad \Rightarrow$

$\Delta y = f(x + \Delta x) - f($

(c)