1. Linearization of f at $x = 0$

   $f(0) = 0$

   $f'(x) = 2x + 2 \longrightarrow f'(0) = 2$

   $L(x) = 2x$

   Approximation of f at $x = .1$

   $L(.1) = .2 \therefore f(.1) \approx .2$

2. Linearization of f at $x = 1$

   $f(1) = 0$

   $f'(x) = 1 \longrightarrow f'(1) = 1$

   $L(x) = x - 1$

   Approximation of f at $x = .6$

   $L(.6) = -.4 \therefore f(.6) \approx -.4$

3. Linearization of f at $x = -1$

   $f(-1) = -5$

   $f'(x) = 4x + 4 \longrightarrow f'(-1) = 0$

   $L(x) = -5$

   Approximation of f at $x = -.9$

   $L(-.9) = -5 \therefore f(-.9) \approx -5$

4. Linearization of f at $x = 8$

   $f(8) = 2$

   $f'(x) = \dfrac{1}{3\sqrt[3]{x^2}} \longrightarrow f'(8) = \dfrac{1}{12}$

   $L(x) = 2 + \dfrac{1}{12}(x - 8)$

   Approximation of f at $x = 8.5$

   $L(8.5) = 2.042 \therefore f(8.5) \approx 2.042$

5. Linearization of f at $x = 1$

   $$f(1) = \frac{1}{2}$$

   $$f'(x) = \frac{1}{(x+1)^2} \quad \longrightarrow \quad f'(1) = \frac{1}{4}$$

   $$L(x) = \frac{1}{2} + \frac{1}{4}(x-1)$$

   Approximation of f at $x = 1.3$

   $$L(1.3) = .575 \quad \therefore \quad f(1.3) \approx .575$$

6. Linearization of f at $x = -4$

   $$f(-4) = 5$$

   $$f'(x) = \frac{x}{\sqrt{x^2 + 9}} \quad \longrightarrow \quad f'(-4) = -\frac{4}{5}$$

   $$L(x) = 5 - \frac{4}{5}(x+4)$$

   Approximation of f at $x = -3.8$

   $$L(-3.8) = 4.840 \quad \therefore \quad f(-3.8) \approx 4.840$$

7. $f(1) = 1$

   $$f'(x) = 4x^3 \quad \longrightarrow \quad f'(1) = 4$$

   $$L(x) = 1 + 4(x-1) \quad \longrightarrow \quad L(x) = 4x - 3$$

8. $f(0) = 0$

   $$f'(x) = \cos x \quad \longrightarrow \quad f'(0) = 1$$

   $$L(x) = 0 + 1(x - 0) \quad \longrightarrow \quad L(x) = x$$

9. $f\left(\frac{\pi}{4}\right) = 1$

   $$f'(x) = \sec^2 x \quad \longrightarrow \quad f'\left(\frac{\pi}{4}\right) = 2$$

   $$L(x) = 1 + 2\left(x - \frac{\pi}{4}\right) \quad \longrightarrow \quad L(x) = 2x - \frac{\pi}{2} + 1$$

10. $f(0) = 1^k = 1$

    $$f'(x) = k(1+x)^{k-1}(1) \quad \longrightarrow \quad f'(0) = k$$

    $$L(x) = 1 + k(x - 0) \quad \longrightarrow \quad L(x) = 1 + kx$$

11. Let $f(x) = x^4$ and linearize f at $x = 3$.

    $$f(3) = 81$$

    $$f'(x) = 4x^3 \quad \longrightarrow \quad f'(3) = 108$$

    $$L(x) = 81 + 108(x - 3)$$

    $$L(3.02) = 83.160 \quad \longrightarrow \quad f(3.02) \approx 83.160 \quad \longrightarrow \quad 3.02^4 \approx 83.160$$

12. Let $f(x) = \sqrt{x}$ and linearize f at $x = 25$.

$f(25) = 5$

$f'(x) = \dfrac{1}{2\sqrt{x}} \longrightarrow f'(25) = \dfrac{1}{10}$

$L(x) = 5 + \dfrac{1}{10}(x - 25)$

$L(24) = 4.900 \longrightarrow f(24) \approx 4.900 \longrightarrow \sqrt{24} \approx 4.900$

13. Let $f(x) = \sqrt[3]{x}$ and linearize f at $x = 27$.

$f(27) = 3$

$f'(x) = \dfrac{1}{3\sqrt[3]{x^2}} \longrightarrow f'(27) = \dfrac{1}{27}$

$L(x) = 3 + \dfrac{1}{27}(x - 27)$

$L(26) = 3 - \dfrac{1}{27} \approx 2.963 \longrightarrow f(26) \approx 2.963 \longrightarrow \sqrt[3]{26} \approx 2.963$

14. Let $f(x) = \sin x$ and linearize f at $x = 0$.

$f(0) = 0$

$f'(x) = \cos x \longrightarrow f'(0) = 1$

$L(x) = 0 + 1(x - 0) \longrightarrow L(x) = x$

$L(.1) = .1 \longrightarrow f(.1) \approx .1 \longrightarrow \sin .1 \approx .1$