

Section 4.2 pg 225 # 17, 21, 23, 25, 29, 33.

①7  $f(x) = \frac{1}{1-x}$  near  $a=0$

$$L(x) = f(a) + f'(a)(x-a)$$

$$= 1 + 1(x-0)$$

$$= 1+x$$

$$f'(x) = \frac{1}{(1-x)^2} \quad f'(0) = \frac{1}{1} = 1$$

$$f(0) = \frac{1}{1-0} = 1$$

②1  $f(x) = (1-2x)^{3/2}$   $a=0$

$$L(x) = f(a) + f'(a)(x-a)$$

$$= 1 + (-3)(x-0)$$

$$= 1-3x$$

$$f'(x) = \frac{3}{2}(-2)(1-2x)^{\frac{1}{2}}$$

$$f'(0) = -3(1-2(0))^{\frac{1}{2}} = -3$$

$$f(0) = (1-2(0))^{3/2} = 1$$

②3  $f(x) = \sin x$   $a=0$

$$L(x) = f(a) + f'(a)(x-a)$$

$$= 0 + 1(x-0)$$

$$= x$$

$$f'(x) = \cos x$$

$$f(0) = 0$$

$$f'(0) = 1$$

②5  $\sqrt[3]{25}$  we know  $\sqrt[3]{27}$ , so take  $f(x) = \sqrt[3]{x}$  and  $a=27$

$$f'(x) = \frac{1}{3}x^{-2/3} \quad f'(27) = \frac{1}{3(27)^{2/3}} = \frac{1}{3 \cdot 9} = \frac{1}{27} \quad f(27) = 3$$

$$L(x) = f(a) + f'(a)(x-a)$$

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

$$= 3 + \frac{1}{27}x - 1$$

$$= 2 + \frac{1}{27}x$$

$$L(25) = 2 + \frac{1}{27} \cdot 25$$

$$= 2^{25/27}$$

$$\text{so } \sqrt[3]{25} \approx 2^{25/27}$$

(29)  $65^{-2/3}$  here  $f(x) = x^{-2/3}$  we know  $(64)^{-2/3} = \frac{1}{16} = .0625$   
so take  $a = 64$

$$f'(x) = -\frac{2}{3}x^{-5/3}$$

$$f'(64) = -\frac{2}{3} \cdot \frac{1}{4^5} = -\frac{1}{1536} \quad f(64) = \frac{1}{16}$$

$$L(x) = f(a) + f'(a)(x-a)$$
$$= \frac{1}{16} + \frac{-1}{1536}(x-64)$$

$$= \frac{1}{16} - \frac{x}{1536} + \frac{1}{24}$$

$$L(65) = \frac{1}{16} - \frac{65}{1536} + \frac{1}{24} \approx .0618$$

so  $65^{-2/3} \approx .0618$

(33)  $e^{1/10}$  here  $f(x) = e^x$ , we know  $e^0 = 1$ , so take  $a = 0$

$$f'(x) = e^x$$

$$f'(0) = f(0) = 1$$

$$L(x) = f(a) + f'(a)(x-a)$$
$$= 1 + 1(x-0)$$
$$= 1+x$$

$$L(1/10) = 1 + 1/10 = 11/10$$

so  $e^{1/10} \approx \frac{11}{10}$