4.5

25) $y + xy - x = 0$

$y(1+x) = x$

$y = \frac{x}{1+x}$ (f)

$\frac{dy}{dx} = \frac{(1+x) - x}{(1+x)^2} = \frac{1}{(1+x)^2}$ (g)

$dy = \frac{1}{(1+x)^2}\,dx$

$= \frac{1}{(1+0)^2}(.01)$

$= .01$

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

37) $f(x) = (1+x)^k$

$f(0) = (1+0)^k = 1^k = 1$

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

$= 1 + k(x-0)$

$= 1 + kx$

$f'(x) = k(1+x)^{k-1}$

$f'(0) = k(1+0)^{k-1} = k$

$f(x) = (1+x)^k \iff L(x) = 1 + kx$

39) (a) $f(x) = (1-x)^6$

$= (1+(-x))^6 \iff L(x) = 1 + 6(-x)$

$= 1 - 6x$

(b) $f(x) = \frac{2}{1-x} = 2(1+(-x))^{-1}$ ($=k$) $\iff 2(1+(-1)(-x))$

$2(1+x)$

$2+2x$

(c) $f(x) = \frac{1}{\sqrt{1+x}} = (1+x)^{-1/2} \iff L(x) = 1 + -\frac{1}{2}x$

4.5

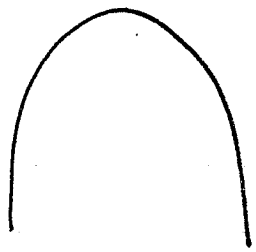
35) $V = \frac{4}{3}\pi r^3$

$\frac{dV}{dr} = 4\pi r^2$

$dV = 4\pi r^2 dr$

$= 4\pi (a)^2 dr$

$4\pi (10)^2 (.05) = 20\pi \text{ cm}^3$



39) $V = \pi r^2 h$

$\frac{dV}{dr} = 2\pi h r$

$dV = 2\pi h r \, dr$

$dV = 2\pi h (a) \, dr$

$2\pi h (10)(.05) = \pi h \text{ cm}^3$

1) $f(x) = x^3 - 2x + 3$

$f(2) = 2^3 - 2(2) + 3 = 7$

$f'(x) = 3x^2 - 2$

$f'(2) = 3(2)^2 - 2 = 10$

$L(x) = 7 + 10(x - 2)$

$L(2.1) = 7 + 10(2.1 - 2)$

$= 8$

$f(2.1) = (2.1)^3 - 2(2.1) + 3$

$= 8.061$

4.5

9) $f(x) = (1-x)^6$ $\quad k=6$

$1 + kx$

$1 + 6(-x)$

$f(x) = (1 + (-x))^6$ $\quad$ "x" $= -x$

$\boxed{L(x) = 1 - 6x}$

(b) $f(x) = \frac{2}{1-x}$

$f(x) = 2(1+(-x))^{-1}$ $\quad$ "x" $\quad k=-1$

$f(x) = 2(1 + (-x))^{-1}$

$L(x) = (1 + (-1)(-x))2$

$= (1+x)2$

$= 2 + 2x$

(c) $f(x) = \frac{1}{\sqrt{1+x}}$

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

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

4.5

35) $V = \frac{4}{3}\pi r^3$

$\frac{dV}{dr} = 4\pi r^2$

$dV = 4\pi r^2 dr$

r r dr

a to a+dr

$\boxed{4\pi a^2 dr}\ cm^3$

r r dr r dr

10 to 10.05 10+.05

$4\pi(10)^2(.05)$

$\boxed{20\pi\ cm^3}$

37) $V = x^3$

$\frac{dV}{dx} = 3x^2$

$dV = 3x^2 dx$

x x dx

a to a+dx

$\boxed{dV = 3a^2 dx}$

x x dx x dx

10 to 10.05 10+.05

$dV = 3(10)^2(.05)$

$= \boxed{15\ cm^3}$

25) $y + \overset{f}{x}\overset{g}{y} - x = 0 \longrightarrow y(1+x) - x = 0$

$\frac{dy}{dx} + y + x\frac{dy}{dx} - 1 = 0$

$-y \quad +1 \quad -y+1$

$\frac{y(1+x)}{1+x} = \frac{x}{1+x}$

$y = \frac{x}{1+x}$

$\frac{\frac{dy}{dx}(1+x)}{1+x} = \frac{-y+1}{1+x}$

$\frac{dy}{dx} = \frac{-y+1}{1+x} = \boxed{\frac{\left(\frac{-x}{1+x}\right)+1}{1+x}\,dx = dy}$

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$$\frac{(1+x)\cdot\left(\frac{-x}{1+x}\right)+1}{(1+x)} \, dx = dy$$

$$\frac{-x+1+x}{(1+x)^2}\,dx = dy$$

(a) $$\boxed{\frac{1}{(1+x)^2}\,dx = dy}$$

$x=0$

$dx=.01$

$$\frac{1}{(1+0)^2}(.01) = dy$$

(b) $$\boxed{.01 = dy}$$

7) $f(x) = (1+x)^k \quad x=0 \quad (0,1)$

$f(0) = (1+0)^k = 1^k = 1$

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

$= 1 + kx$

$f'(x) = k(1+x)^{k-1}$

$f'(0) = k(1+0)^{k-1}$

$= k$

4.5

15) $x^3 + x - 1 = 0$

n	x_n	$f(x_n)$	$f'(x_n)$	$\frac{f(x_n)}{f'(x_n)}$	$x_n - \frac{f(x_n)}{f'(x_n)}$
1	1	1	4	.25	.75
2	.75	.17188	2.6875	.06395	.68605
3	.68605	.00895	2.412	.00371	.682339
4	.682339	.000027	2.3968	.000011	.682327
5	.682327	-.000002	2.3967	-.0000008	.682327