18 Sept 2009

p116 #78

$f(x) = \frac{2}{x}$ $(x_0, y_0) = (5, 0)$

$y = \frac{2}{x} = 2x^{-1}$

$y' = -2x^{-2} = \frac{-2}{x^2}$

$(a, \frac{2}{a})$ $m = \frac{-2}{a^2} = \frac{\frac{2}{a} - 0}{a-5}$

$-2a + 10 = \frac{2}{a}(a^2)$

$-2a + 10 = 2a$

$10 = 4a$

$5/2 = a$ $m = \frac{-2}{25/4}$

$(\frac{5}{2}, \frac{4}{5})$

$$\boxed{y = \frac{-8}{25}(x-5)}$$

110) (a, b) $y = 1/x$ $x > 0$ $y' = -1x^{-2} = \frac{-1}{x^2}$

$(x_1, y_1) = (a, \frac{1}{a})$ $m = -\frac{1}{a^2}$

$y - 1/a = -1/a^2 (x - a)$

$y - 1/a = \frac{-1}{a^2}x + \frac{1}{a}$

$y = \frac{-1}{a^2}x + \frac{2}{a}$

if $y = 0$ $\frac{1}{a^2}x = \frac{2}{a}$ $x = 2a$

y-int $(0, \frac{2}{a})$

x-int $(2a, 0)$

Area

$\frac{1}{2}(2a)(\frac{2}{a})$

2

6c) $f(x) = K\sqrt{x}$ $\quad$ $y = x+4$

$y = Kx^{1/2}$ $\quad$ $m = 1$

$y' = \frac{1}{2}Kx^{-1/2}$ $\quad$ $(a, K\sqrt{a})$

$(a, a+4)$

$\frac{1}{2}Ka^{-1/2} = 1$

$\frac{K}{2\sqrt{a}} = 1$ $\quad$ $K = 2\sqrt{a}$

$a+4 = K\sqrt{a}$ $\quad$ $K = 2\sqrt{4} = 4$

$a+4 = 2\sqrt{a}\sqrt{a}$

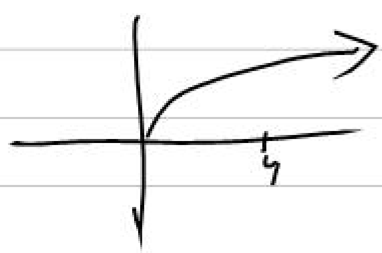
$a+4 = 2a$

$4 = a$

$x^2 = 4$

$x = \pm\sqrt{4}$

$\sqrt{4}$



$y = \sqrt{x}$

$$\frac{d}{dx}\left[f(x) \cdot g(x)\right] = \left(\frac{d}{dx} f(x)\right)\left(g(x)\right) + \left(\frac{d}{dx} g(x)\right)\left(f(x)\right)$$

$$\frac{d}{dx}(fg) = f'g + g'f$$

$$\frac{d}{dx}\left[f(x)\,g(x)\right] = \lim_{\Delta x \to 0} \frac{(fg)(x+\Delta x) - (fg)(x)}{\Delta x}$$

$$\lim_{\Delta x \to 0}\left[\frac{f(x+\Delta x)\,g(x+\Delta x) - f(x)\,g(x)}{\Delta x}\right]$$

$$\lim_{\Delta x \to 0}\left[\frac{f(x+\Delta x)\,g(x+\Delta x) - f(x)\,g(x+\Delta x) + f(x)\,g(x+\Delta x) - f(x)g(x)}{\Delta x}\right]$$

$$\lim_{\Delta x \to 0}\left[\frac{f(x+\Delta x)\,g(x+\Delta x) - f(x)\,g(x+\Delta x)}{\Delta x}\right] + \lim_{\Delta x \to 0}\left[\frac{f(x)\,g(x+\Delta x) - f(x)g(x)}{\Delta x}\right]$$

$$\lim_{\Delta x \to 0} g(x+\Delta x) \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} + \lim_{\Delta x \to 0} f(x) \lim_{\Delta x \to 0} \frac{g(x+\Delta x) - g(x)}{\Delta x}$$

$$g(x)\,f'(x) + f(x)\,g'(x)$$

$$y = \sin 2x$$

ex $\quad y = \underline{2\sin x}\ \underline{\cos x}$

$$y' = 2\cos x \cos x + (-\sin x)(2\sin x)$$

$$2\cos^2 x - 2\sin^2 x = 2\left(\cos^2 x - \sin^2 x\right)$$

$$2\cos 2x$$

$$\frac{d}{dx}\frac{f(x)}{g(x)} = \frac{f'(x)\,g(x) - g'(x)\,f(x)}{[g(x)]^2}$$

$$\frac{d}{dx}\tan x = \frac{d}{dx}\frac{\sin x}{\cos x} = \frac{(\cos x)(\cos x) - (-\sin x)\sin x}{\cos^2 x}$$

$$= \frac{\cos^2 x + \sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x} = \sec^2 x$$

$$\boxed{\frac{d}{dx}\tan x = \sec^2 x}$$

$$\boxed{\frac{d}{dx}\cot x = -\csc^2 x}$$

$$\frac{d}{dx}\sec x = \frac{d}{dx}\left(\frac{1}{\cos x}\right) = \frac{0 \cdot \cos x - (-\sin x)(1)}{(\cos^2 x)}$$

$$\frac{\sin x}{\cos^2 x} = \frac{1}{\cos x}\cdot\frac{\sin x}{\cos x}$$

$$\boxed{\frac{d}{dx}\sec x = \sec x \tan x}$$

$$\boxed{\frac{d}{dx}\csc x = -\csc x \cot x}$$

y' $f'(x)$ $\frac{dy}{dx}$ $\frac{d f(x)}{dx}$ $D_x y$ $D_x f(x)$

y'' $f''(x)$ $\frac{d^2 y}{dx^2}$ $\frac{d^2 f(x)}{dx^2}$ $D_{x^2} y$ $D_{x^2} f(x)$

y''' $f'''(x)$ $\frac{d^3 y}{dx^3}$ $\frac{d^3 f(x)}{dx^2}$ $D_{x^3} y$ $D_{x^3} f(x)$

y^{IV} $y^4(x)$

Nth derivative

y^n $f^n(x)$ $\frac{d^n y}{dx^n}$ $D_{x^n} y$

$y = \frac{1}{x} = x^{-1}$

$y' = -1x^{-2} = \frac{-1}{x^2}$

$y'' = 2x^{-3} = \frac{2}{x^3}$

$y''' = -6x^{-4} = \frac{-6}{x^4}$

$$\frac{d}{dx}\frac{f(x)}{g(x)} = \lim_{\Delta x \to 0} \frac{\frac{f(x+\Delta x)}{g(x+\Delta x)} - \frac{f(x)}{g(x)}}{\Delta x}$$

$$= \lim_{\Delta x \to 0} \frac{f(x+\Delta x)\, g(x) - f(x)\, g(x+\Delta x)}{\Delta x\, g(x)\, g(x+\Delta x)}$$

$$= \lim_{\Delta x \to 0} \frac{f(x+\Delta x)\, g(x) - f(x)\, g(x) + f(x)\, g(x) - f(x)\, g(x+\Delta x)}{\Delta x\, g(x)\, g(x+\Delta x)}$$

$$= \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x} \lim_{\Delta x \to 0} \frac{g(x)}{g(x)\, g(x+\Delta x)} - \lim_{\Delta x \to 0} \frac{f(x)}{g(x)\, g(x+\Delta x)} \lim_{\Delta x \to 0} \frac{g(x+\Delta x) - g(x)}{\Delta x}$$

$$\frac{f'(x)\, g(x)}{g(x)\, g(x)} - \frac{f(x)\, g'(x)}{g(x)\, g(x)}$$

$$\frac{f'(x)\, g(x) - f(x)\, g'(x)}{[g(x)]^2}$$