MATH110 ASSIGNMENT-02

ASHEKINA-E-RASUL
ID:20301454
SECTION:09
SET:C

1.1st derivative:

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

2nd derivative:

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

$$= -\frac{1}{4}(x-1)^{-\frac{3}{2}}(\text{Ans})$$

2(a). $\frac{d}{dx}[ln(sinx - cotx)]$

$$= \frac{d}{d(sinx - cotx)}[ln(sinx - cotx)].\frac{d}{dx}(sinx - cotx)$$

$$= \frac{cosx + cosec^2x}{sinx - cotx}(\text{Ans})$$

2(b). $\dfrac{d}{dz}[tan^4(z^2+1)]$

$$= \frac{d}{d(tan(z^2+1))}.[tan^4(z^2+1)].\frac{d}{d(z^2+1)}.[tan(z^2+1)].\frac{d}{dz}.(z^2+1)$$

$$= 4tan^3(z^2+1).sec^2(z^2+1).2z$$

$$= 8ztan^3(z^2+1).sec^2(z^2+1)(\text{Ans})$$

3. As,

$y = ln\dfrac{1}{x}$

if $x = 1; y = ln\dfrac{1}{1}$

so,

$x = 1; y = 0$

The slope will be

$\dfrac{d}{dx}\left(ln\dfrac{1}{x}\right)$

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

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

$$= -\frac{1}{1}$$ [at x=1]

$$= -1$$

so the slope will be m=-1 [when x=1]

so the equation of tangent line:

$y - 0 = -1(x - 1)$ [x= 1 ; y= 0 ;m=-1]

$y = -x + 1$(Ans)

4. 1st derivative:

$$f^{'}(x) = -sin(lnx).\frac{1}{x}$$

$$f^{'}(x) = -\frac{sin(lnx)}{x}\text{(Ans)}$$

BONUS QUESTIONS

5(a) The derivative of even function is an odd function:

we know even function is $f(-x) = f(x)$

so the derivative of both side

$$\frac{d}{d(x)}f(-x) = \frac{d}{dx}f(x)$$

$$\frac{d}{d(x)}f(-x).\frac{d}{d(x)}(-x) = \frac{d}{dx}f(x)$$

$$or, f^{'}(-x).(-1) = f^{'}(x)$$

$$or, f^{'}(-x) = -f^{'}(x)$$

$f^{'}(-x) = -f^{'}(x)$ is a odd function(Proved)

5(b) The derivative of odd function is an even function:

we know even function is $f(-x) = -f(x)$

so the derivative of both side

$$\frac{d}{d(x)}f(-x) = \frac{d}{dx} - f(x)$$

$$\frac{d}{d(x)}f(-x).\frac{d}{d(x)}(-x) = \frac{d}{dx}(-f(x))$$

$$or, f^{'}(-x).(-1) = -f^{'}(x)$$

$$or, f^{'}(-x) = f^{'}(x)$$

$f^{'}(-x) = f^{'}(x)$ is a even function(Proved)

6.Find the first and second derivative of the following function with respect to b

$$cos\left(\frac{r}{2}\left[\frac{b^4}{4}\left(1-\frac{2sinh^2(8\pi l_sQ)}{sinh^2(9\pi l_sQ)}\right)\right]^{\frac{1}{4}}\right)$$

$$cos\left((b^4)^{\frac{1}{4}}.\frac{r}{2}\left[\frac{1}{4}\left(1-\frac{2sinh^2(8\pi l_sQ)}{sinh^2(9\pi l_sQ)}\right)\right]^{\frac{1}{4}}\right)$$

$$cos\left(b.\frac{r}{2}\left[\frac{1}{4}\left(1-\frac{2sinh^2(8\pi l_sQ)}{sinh^2(9\pi l_sQ)}\right)\right]^{\frac{1}{4}}\right)$$

1st derivative:

$$= -sin\left(b.\frac{r}{2}\left[\frac{1}{4}\left(1-\frac{2sinh^2(8\pi l_sQ)}{sinh^2(9\pi l_sQ)}\right)\right]^{\frac{1}{4}}\right).\left(b^{1-1}.\frac{r}{2}\left[\frac{1}{4}\left(1-\frac{2sinh^2(8\pi l_sQ)}{sinh^2(9\pi l_sQ)}\right)\right]^{\frac{1}{4}}\right)$$

$$= -sin\left(b.\frac{r}{2}\left[\frac{b^4}{4}\left(1-\frac{2sinh^2(8\pi l_sQ)}{sinh^2(9\pi l_sQ)}\right)\right]^{\frac{1}{4}}\right).\left(\frac{r}{2}\left[\frac{1}{4}\left(1-\frac{2sinh^2(8\pi l_sQ)}{sinh^2(9\pi l_sQ)}\right)\right]^{\frac{1}{4}}\right)$$

2nd derivative:

$$= -cos\left(b.\frac{r}{2}\left[\frac{1}{4}\left(1-\frac{2sinh^2(8\pi l_sQ)}{sinh^2(9\pi l_sQ)}\right)\right]^{\frac{1}{4}}\right).\left(b^{1-1}.\frac{r}{2}\left[\frac{1}{4}\left(1-\frac{2sinh^2(8\pi l_sQ)}{sinh^2(9\pi l_sQ)}\right)\right]^{\frac{1}{4}}\right)$$
$$.\left(\frac{r}{2}\left[\frac{1}{4}\left(1-\frac{2sinh^2(8\pi l_sQ)}{sinh^2(9\pi l_sQ)}\right)\right]^{\frac{1}{4}}\right)$$

$$= -cos\left(b.\frac{r}{2}\left[\frac{1}{4}\left(1-\frac{2sinh^2(8\pi l_s Q)}{sinh^2(9\pi l_s Q)}\right)\right]^{\frac{1}{4}}\right).\left(\frac{r}{2}\left[\frac{1}{4}\left(1-\frac{2sinh^2(8\pi l_s Q)}{sinh^2(9\pi l_s Q)}\right)\right]^{\frac{1}{4}}\right)^2 \text{(Ans)}$$