Tuesday, October 6, 2020

1) Find the derivative of the following functions

10 points each

$$g(x) = \left(\frac{x^3 - 1}{x^3 + 1}\right)^5$$

 $h(x) = \sin(x)\ln(x^2 + 1)$

 $k(x) = x \tan^{-1}(x)$

 $m(x) = \ln(\sinh(x))$

2) Find the second derivative of $f(x) = e^x \cos(x)$

3) Find $\frac{dy}{dx}$ for $y^5 + x^2y^3 = 1 + ye^3$

10 points

4) Let $f(x) = \frac{e^x}{x^2 + 1}$. Find the equation of the tangent line at (0,1).

4) Use linear approximation (or differentials) to estimate $\sqrt{15.8}$

5) At noon, ship A is 150 km west of ship B. Ship A is sailing east at 35 km/hr and ship B is sailing north at 25 km/hr. How fast is the distance between the shops changing at

1) Find the derivative

 $f(x) = e^{tan(2x)}$

 $f'(x) = \frac{d}{dx} \left[e^{\tan(2x)} \right]$

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= etan(2x) dtan(u) [tan(2x)] d/ (2x)

= e tan (2x) sec 2 (2x) (2)

 $f'(x) = 2sec^2(2x)e^{ton(2x)}$

 $K(x) = x tan^{-1}(x)$

 $K'(x) = \frac{d}{dx} \left[x \tan^{-1}(x) \right]$

= $x \frac{d}{dx} \left[\tan^{-1}(x) \right] + \tan^{-1}(x) \frac{d}{dx}(x)$

 $= \times \left(\frac{1}{1+x^2}\right) + \tan^{-1}(x)(1)$

 $K'(x) = \frac{x}{1+x^2} + \tan^{-1}(x)$

 $h(x) = \sin(x) \ln(x^2 + 1)$

 $h'(x) = \frac{d}{dx} \left[sin(x) | n(x^2 + 1) \right]$

= $sin(x) \frac{d}{dx} \left[ln(x^2+1) \right] + ln(x^2+1) \frac{d}{dx} \left[sin(x) \right]$

 $q(x) = \left(\frac{x^3 - 1}{x^3 + 1}\right)^5$

 $g'(x) = \frac{d}{dx} \left(\frac{x^3 - 1}{x^3 + 1} \right)^5$

 $=\frac{dn^{5}}{du}\left(\frac{\chi^{3}-1}{\chi^{3}+1}\right)^{5}\frac{d}{d\chi}\left(\frac{\chi^{3}-1}{\chi^{3}+1}\right)$

 $= S\left(\frac{x^{3}-1}{x^{3}+1}\right)^{4} \left[0+\frac{(x^{3}-1)\frac{1}{dx}(2)-2\frac{d}{dx}(x^{3}-1)}{(x^{3}-1)^{2}}\right]$

 $= S\left(\frac{\chi^{2} - 1}{\chi^{3} + 1}\right)^{4} \frac{d}{d\chi}\left(1 + \frac{2}{\chi^{3} - 1}\right)$

 $= \left\{ \left(\frac{\chi^{3} - 1}{\chi^{3} + 1} \right)^{4} \left[\left(\chi^{3} - 1 \right) - 2 \left(3 \chi^{2} \right) \right] \right\}$

 $q'(x) = S\left(\frac{x^2 - 1}{\chi^3 + 1}\right)^4 \left[\frac{x^3 - 6x^2 - 1}{(x^3 - 1)^2}\right]$

= $\sin(x) \frac{d\ln(u)}{du} \left[\ln(x^2+1)\right] \frac{d}{dx} \left(x^2+1\right) + \ln(x^2+1) \cos(x)$

 $x^{3} - | x^{3} + |$ $x^{3} - | x^{3} + |$

 $= sin(x) \frac{1}{x^2+1} (2x) + ln(x^2+1) cos(x)$

 $\int_{1}^{1} (x) = \frac{2x \sin(x)}{x^{2}+1} + \omega \zeta(x) \ln(x^{2}+1)$

m(x) = ln(sinh(x))

 $=\frac{d}{dx}\left[\ln\left(\sinh(x)\right)\right]$

 $= \frac{d \ln(u)}{d u} \left[\ln(\sinh(x)) \right] \frac{d}{dx} \left[\sinh(x) \right]$

= cinh(x) cosh(x)

 $m(x) = \frac{\cosh(x)}{\sinh(x)}$ or $\coth(x)$





