2.5 Practice (Chain Rule)

Ex 1 $D_x\left(\cos^2(\cos(\cos(\sin(2x))))\right)$

Ex 2 Find y'.

(a) $y = (2x^{7/2} - 4x^2)^3 + \tan^2(3x-1)$

(b) $y = \left(\dfrac{\sin(5x)}{\sqrt{x} - 1/x^2}\right)^4$

Ex 3 Find $D_x\left(F\left(x^2 - \frac{1}{x^2}\right)\right)$ if $F(x)$ is some differentiable fn.

2.6 Practice (Higher Order Derivatives)

Ex 1 Find $\frac{d^3(x^{-3})}{dx^3}$

Ex 2 Find $D_x^{14}(96x^{14} - 81x^9)$

Ex 3 If $s = \frac{1}{10}(t^4 - 14t^3 + 60t^2)$, find the velocity of the moving object when its acceleration is zero.

Ex 4 Find $f''(2)$. $f(x) = \frac{(x+1)^2}{x-1}$

2.7 Practice (Implicit Differentiation)

Ex 1 Find $\frac{dy}{dx}$.

(a) $x^2 + 2x^2y + 3xy = 0$

(b) $\cos(xy^3) = y^3 + x$

Ex 3 Find y' at $(3,4)$ if $x^2+y^2=25$.

Ex2 Find $\frac{dy}{dx}$.

(a) $y = \sqrt[3]{x^2 \cos x}$

(b) $\sqrt{xy} + \cos x = 3y^2$

2.8 Practice (Related Rates)

Ex 1 The vertex angle θ opposite the base of an isosceles triangle w/ equal sides of length 100 cm is increasing at $\frac{1}{10}$ radian per minute. How fast is the area of the triangle increasing when the vertex angle measures $\pi/6$ radians?

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Ex 2 A metal disk expands during heating. If its radius increases at a rate of 0.02 in/sec, how fast is the area of one of its faces increasing when its radius is 8.1 inches?

Ex 3 A woman on a dock is pulling in a rope fastened to the bow of a small boat. If the woman's hands are 10 ft higher than the point where the rope is attached to the boat and if she is retrieving the rope at a rate of 2 ft/sec, how fast is the boat approaching the dock when 25 ft of rope is still out?

2.9 Practice (Differentials)

Ex 1 Find dy.

(a) $y = (x^{10} + \sin^2 2x)^{1/2}$

(b) Let $y = f(x) = x^3$. $x = 0.5$, $dx = 1$.

Ex 2 Let $y = \frac{1}{x^3}$. Find dy, if

(a) $x = 1$, $dx = 0.5$

(b) $x = -2$, $dx = 3/4$