Worksheet: chain rule
Math 102 Section 102
Oct. 19, 2018

Solution

1. **Calculate** $\frac{d}{dx}(x^2+17x-9)^5$

$$\frac{d}{dx}(x^2+17x-9)^5$$

$$= 5(x^2+17x-9)^4 \cdot \frac{d}{dx}(x^2+17x-9)$$

$$= 5(x^2+17x-9)^4(2x+17)$$

2. $\frac{d}{dx}\sqrt{(2x^5+x^3)^4+22x^2}$

$$\frac{d}{dx}\sqrt{(2x^5+x^3)^4+22x^2}$$

$$= \frac{1}{2}\frac{1}{\sqrt{(2x^5+x^3)^4+22x^2}} \cdot \frac{d}{dx}\left[(2x^5+x^3)^4+22x^2\right]$$

$$= \frac{4(2x^5+x^3)^3(10x^4+3x^2)+44x}{2\sqrt{(2x^5+x^3)^4+22x^2}} = \frac{2(2x^5+x^3)^3(10x^4+3x^2)+22x}{\sqrt{(2x^5+x^3)^4+22x^2}}$$

3. **A sphere's volume is increasing at a rate of 3m^3 per minute. How fast is its radius increasing when its radius is 1 metre?**

Let r be the sphere's radius, and V be its volume.

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

Differentiate both sides with respect to t:

$$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$$ We know $\frac{dV}{dt} = 3\ m^3/min$ and $r = 1m$

So $\frac{dr}{dt} = \frac{1}{4\pi r^2}\frac{dV}{dt} = \frac{1}{4\pi \cdot 1} \cdot 3\ m/min = \frac{3}{4\pi}\ m/min$

4. **Chapter 8 of the online textbook: Examples 8.11, 8.13**

(See textbook on how to solve these problems)