Chapter 8: Introducing The Chain Rule

Review

\[
\frac{d}{dx} \left( (x^2 + 17x - 9)^5 \right) =
\]

Notes

\[
\frac{d}{dx} \left( \sqrt{x^5 + 22} \right) =
\]

Notes

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

Notes

Ant Highways - Minimum Distance

Notes
Ant Highways

Minimize $f(x) = D - x + 2\sqrt{x^2 + d^2}$

Chain Rule Magic

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

Another way: chain rule

$$\frac{dV}{dt} = \frac{dV}{dr} \frac{dr}{dt}$$

$$3 = \left( \frac{d}{dr} \left[ \frac{4}{3} \pi r^3 \right] \right) \frac{dr}{dt}$$

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

$$3 = 4\pi (1)^2 \cdot \frac{dr}{dt}$$

$$\frac{dr}{dt} = \frac{3}{4\pi} \text{ m/min}$$