

Agenda: 8/25/15

HW leader:

Lesson 24

Power Rule

★ Test 1 on Friday

Period 3

Nathalie Z.

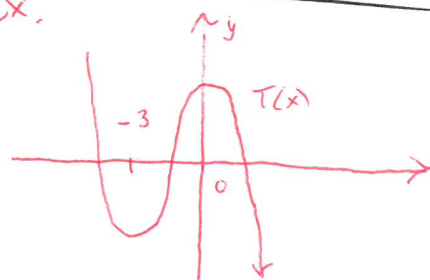
Period 4

Drew H.

Ex. 24.1 Find $g'(x)$ where $g(x) = \sqrt{x}$

$$\begin{aligned} \frac{d}{dx}(\sqrt{x}) &= \lim_{h \rightarrow 0} \frac{g(x+h) - g(x)}{h} \\ &= \lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h} \cdot \frac{\sqrt{x+h} + \sqrt{x}}{\sqrt{x+h} + \sqrt{x}} \\ &= \lim_{h \rightarrow 0} \frac{x+h - x}{h(\sqrt{x+h} + \sqrt{x})} \\ &= \lim_{h \rightarrow 0} \frac{1}{\sqrt{x+h} + \sqrt{x}} = \boxed{\frac{1}{2} x^{-1/2}} \end{aligned}$$

Ex.



- Where is $T'(x) > 0$?
- Where is $T'(x) < 0$?
- Where is $T'(x) = 0$?

You have seen that $\frac{d}{dx}(x^2) = 2x$ and $\frac{d}{dx}(x^3) = 3x^2$ and it follows...

Ex. 24.2 Find $\frac{d}{dx}(x^n)$ when $n = 1, 2, 3, \dots$

$$\begin{aligned} \frac{d}{dx}(x^n) &= \lim_{h \rightarrow 0} \frac{(x+h)^n - x^n}{h} \\ &= \lim_{h \rightarrow 0} \frac{x^n + nx^{n-1}h + \dots + nxh^{n-1} + h^n - x^n}{h} \quad \left[\text{Binomial Expansion!} \right] \\ &= \lim_{h \rightarrow 0} nx^{n-1} + \cancel{\binom{n}{2}x^{n-2}h} + \dots + \cancel{nxh^{n-2}} + \cancel{h^{n-1}} \\ &= \boxed{nx^{n-1}} \end{aligned}$$

Power Rule: $\frac{d}{dx}(x^n) = nx^{n-1}$

Works for any real Power!