DERIVATIVES

OBJECTIVES:

- RECALL & JUSTIFY DERIVATIVE RULES & PROPERTIES THAT WE SAW BEFORE EXAM 1.
- PRACTICE COMPUTING DERIVATIVES USING RULES & PROPERTIES

RECALL...

DERIVATIVES

- IF $f(x) = c$, THEN $f'(x) = 0$.
- IF $f(x) = ax$, THEN $f'(x) = a$.
- IF $f(x) = x^n$, THEN $f'(x) = nx^{n-1}$

POWER RULE

JUSTIFY WHY EACH ONE OF THESE IS TRUE VIA EXAMPLE OR EXPLANATION

WE SHOULD ALSO RECALL THE FOLLOWING PROPERTIES:

PROPERTIES:

- $[f(x) \pm g(x)]' = f'(x) \pm g'(x)$

  EQUIVALENTLY: $\frac{d}{dx}\left(f(x) \pm g(x)\right) = \frac{d}{dx} f(x) \pm \frac{d}{dx} g(x)$
- $[c \cdot f(x)]' = c \cdot f'(x)$ FOR A CONSTANT c.

  EQUIVALENTLY: $\frac{d}{dx}\left(c f(x)\right) = c \cdot \frac{d}{dx} f(x)$

EXAMPLES: USE THE RULES/PROPERTIES WE ALREADY KNOW TO FIND THE DERIVATIVES OF THE FOLLOWING:

(i) $f(x) = (x+9)(x-4)$ → WHAT'S THE ISSUE HERE? HOW CAN I APPLY THE POWER RULE?

FIND $f'(x)$.

→ AFTER THIS, HAT ACTIVITY

FOIL

$$\begin{aligned} f(x) &= (x+9)(x-4) \\ &= x^2 - 4x + 9x - 36 \\ &= x^2 + 5x - 36 \end{aligned}$$

→ NOW I CAN USE POWER RULE!

$2x \quad 5 \quad 0$

SO $\boxed{f'(x) = 2x + 5}$

(ii) $T(z) = \sqrt{z} + 9\sqrt[3]{z^7} - \dfrac{2}{\sqrt[5]{z^2}}$

FIND $T'(z)$.

→ WE MIGHT WANT TO REWRITE THIS FIRST. (USING EXPONENTS)

$$\begin{aligned} T(z) &= z^{1/2} + 9\left(z^7\right)^{1/3} - 2\left(z^2\right)^{-1/5} \\ &= z^{1/2} + 9z^{7/3} - 2z^{-2/5} \end{aligned}$$

→ NOW I CAN USE POWER RULE!

$\left.\begin{aligned} n &= 1/2 \\ n-1 &= -1/2 \end{aligned}\right\} \frac{1}{2} z^{-1/2}$

$\left.\begin{aligned} n &= 7/3 \\ n-1 &= 4/3 \end{aligned}\right\} \left(\frac{7}{3}\right) \cdot 9 z^{4/3}$

$\left.\begin{aligned} n &= -2/5 \\ n-1 &= -7/5 \end{aligned}\right\} \left(\frac{-2}{5}\right) \cdot 2 z^{-7/5}$

SO $\boxed{T'(z) = \frac{1}{2} z^{-1/2} + \left(\frac{7}{3}\right) \cdot 9 z^{4/3} - \left(\frac{-2}{5}\right) \cdot 2 z^{-7/5}}$