

Instructions: You can't do all these problems now, but I'm giving you a large collection of problems since they are useful for practicing on your own. In your graph, try tackling one problem from each of the 3 sections.

1. PRODUCT AND QUOTIENT RULES

$$(1) \frac{d}{dx} \left[\frac{x - \sqrt{x}}{\sqrt[3]{x^2}} \right]$$

$$(2) \frac{d}{dt} \left[(t + e^t)(3 - \sqrt{t}) \right]$$

$$(3) \frac{d}{dt} \left[\frac{2t}{4 + t^2} \right]$$

$$(4) \frac{d}{ds} \left[\frac{1}{s \ln(s)} \right]$$

$$(5) \frac{d^2}{dx^2} [x^2 e^x]$$

$$(6) \frac{d}{dx} \left[\frac{ax + b}{cx + d} \right]$$

$$(7) \frac{d}{d\theta} [(\theta^2 - 2\theta) \tan(\theta)]$$

2. CHAIN RULE AND MORE

$$(1) \frac{d}{dx} [e^{1-x^2}]$$

$$(2) \frac{d}{dt} [\sin(-t)]$$

$$(3) \frac{d}{dx} [(4x^3 - x^2 + 7x + 10)^{100}]$$

$$(4) \frac{d}{dx} [\sqrt[3]{1 + \tan(x)}]$$

$$(5) \frac{d}{dx} [\ln(\ln(x))]$$

$$(6) \frac{d}{dr} [e^{-2r} \cos(4r)]$$

$$(7) \frac{d}{dx} [\tan(\sqrt{x})]$$

$$(8) \frac{d^2}{du^2} [(\cos(u))^2]$$

3. IMPLICIT DIFFERENTIATION

For each of the following, find the slope of the line tangent to the given curve at the given point

(1) $2\sqrt{x} + \sqrt{y} = 3$ at $(1, 1)$

(2) $2x^3 + x^2y - xy^3 = -8$ at $(1, 2)$

(3) $\sin(x) + \cos(y) = \sin(x)\cos(y) + 1$ at $\left(0, \frac{\pi}{2}\right)$