Homework   p 212 1-10 evens   1/6/2017

$$\overset{u}{f(x)} = (2x^3 + x^2 + x)\overset{v}{(x^2 + 1)}$$

$uv \Rightarrow uv' + vu'$

product

$$f'(x) = \overset{u}{(2x^3 + x^2 + x)}\overset{v'}{(2x)} + \overset{v}{(x^2 + 1)}\overset{u'}{(6x^2 + 2x + 1)}$$

$$f'(x) = (4x^4 + 2x^3 + 2x^2) + \left(6x^4 + 2x^3 + x^2 + 6x^2 + 2x + 1\right)$$

$$f'(x) = 10x^4 + 4x^3 + 9x^2 + 2x + 1$$

---

④ $f(x) = e^x \ln x$

product

$$f'(x) = (e^x)\left(\frac{1}{x}\right) + (\ln x)(e^x)$$

$$f'(x) = e^x \left(\frac{1}{x} + \ln x\right)$$

---

⑥ $f(x) = \dfrac{e^x}{e^x + 1}$ quotient $\dfrac{u}{v} \Rightarrow \dfrac{vu' - uv'}{v^2}$

$$f'(x) = \frac{(e^x + 1)(e^x) - (e^x)(e^x)}{(e^x + 1)^2}$$

$$f'(x) = \frac{e^x(e^x + 1 - e^x)}{(e^x + 1)^2}$$

$$f'(x) = \frac{e^x(\,+1)}{(e^x + 1)^2} = \boxed{\frac{e^x}{(e^x + 1)^2}}$$

(8) $f(x) = \dfrac{2-x^2}{x^3+1}$ ⟩ quotient $\dfrac{u}{v} \rightarrow \dfrac{vu' - uv'}{v^2}$

$$f'(x) = \dfrac{(x^3+1)(-2x) - (2-x^2)(3x^2)}{(x^3+1)^2}$$

$$f'(x) = \dfrac{-2x^4 - 2x - (6x^2 - 3x^4)}{(x^3+1)^2}$$

$$f'(x) = \dfrac{-2x^4 - 2x - 6x^2 + 3x^4}{(x^3+1)^2}$$

$$f'(x) = \dfrac{x^4 - 6x^2 - 2x}{(x^3+1)^2} \quad \text{or} \quad \dfrac{x(x^3 - 6x - 2)}{(x^3+1)^2}$$

---

(10) $f(x) = \dfrac{x+1}{x-1}$ ⟩ quotient $\dfrac{u}{v} \Rightarrow \dfrac{vu' - uv'}{v^2}$

Slope

$x + 2y = 10$
$2y = -x + 10$
$y = -\tfrac{1}{2}x + 5$

$\boxed{m = \tfrac{-1}{2}}$ ↗

point

$$f'(x) = \dfrac{(x-1)(1) - (x+1)(1)}{(x-1)^2}$$

$$f'(x) = \dfrac{x - 1 - x - 1}{(x-1)^2}$$

$$f'(x) = \dfrac{-2}{(x-1)^2} \quad \rightarrow \quad y = \dfrac{x+1}{x-1}$$

to find x

$-\tfrac{1}{2} = \dfrac{-2}{(x-1)^2}$

$-4 = -(x-1)^2$

$-4 = -(x^2 - 2x + 1)$

$-4 = -x^2 + 2x - 1$

$0 = -x^2 + 2x + 3$

$0 = x^2 - 2x - 3$

$0 = (x-3)(x+1)$

$x = 3 \quad x = -1$

$y = \dfrac{3+1}{3-1} \quad y = \dfrac{-1+1}{-1-1}$

$y = \dfrac{4}{2} \quad y = \dfrac{0}{-2}$

$y = 2 \quad y = 0$

$$\boxed{\begin{array}{l} y - 2 = -\tfrac{1}{2}(x-3) \\ y - 0 = -\tfrac{1}{2}(x+1) \end{array}}$$