$$[f(x)]'' = [f'(x)]'$$

$$[\sin(x)]'' = (\cos x)' = -\sin x$$

$$[x^5]'' = (5x^4)' = 20x^3$$

$$\frac{df}{dx}, \frac{d^2f}{dx^2}, \frac{d^3f}{dx^3}, \frac{d^4f}{dx^4}, \ldots, \frac{d^nf}{dx^n}$$

$$f(x) = 3x^4 - 2x^3 + 5x^2 - 3x + 2$$
$$f'(x) = 12x^3 - 6x^2 + 10x - 3$$
$$f''(x) = 36x^2 - 12x + 10$$
$$f^{(3)}(x) = 72x - 12$$
$$f^{(4)}(x) = 72$$
$$f^{(5)}(x) = 0$$
$$f^{(6)}(x) = 0$$

find $f^{(23)}(x)$ of $f(x) = 7x^{20} - 5x^4$

$$f^{(23)}(x) = 0.$$

$$f(x) = 2e^{\arcsin(5x^2)}$$

$$y = 2e^u$$
$$y' = 2e^u \cdot u'$$
$$u = \arcsin v$$
$$u' = \frac{1}{\sqrt{1-v^2}} \cdot v'$$
$$v = 5x^2$$
$$v' = 10x$$

$$f'(x) = 2e^{\arcsin 5x^2} \cdot \frac{1}{\sqrt{1-(5x^2)^2}} \cdot 10x$$

$$f(x) = [\tan(\ln x)] \cdot [5^{2x}]$$

$$f'(x) = [\tan(\ln x)]' \cdot 5^{2x} + \tan(\ln x) \cdot [5^{2x}]'$$

$$= \sec^2(\ln x) \cdot \frac{1}{x} \cdot 5^{2x} + \tan(\ln x) \cdot 5^{2x} \cdot 2 \cdot \ln 5$$

$$f(x) = \frac{\arctan(5\sin x)}{\log_3(4x^5)} \qquad (\log_3 u)' = \frac{u'}{u \ln 3}$$

$$f'(x) = \frac{(\log_3(4x^5)) \cdot \frac{5\cos x}{1+(5\sin x)^2} - \arctan(5\sin x) \cdot \frac{20x^4}{4x^5 \ln 3}}{(\log_3(4x^5))^2}$$

$$\left(\frac{f}{g}\right)' = \frac{gf' - fg'}{g^2}$$

$$f(x) = \sec^2(5\ln(x^2) - e^{3x})$$

$$= \left[\sec(5\ln(x^2) - e^{3x})\right]^2$$

$$f'(x) = 2\left[\sec(5\ln(x^2) - e^{3x})\right] \cdot$$

$$\cdot \left[\sec(5\ln(x^2) - e^{3x})\tan(5\ln(x^2) - e^{3x})\right] \cdot$$

$$\cdot \left[\frac{5}{x^2} \cdot 2x - e^{3x} \cdot 3\right]$$

$$\left[5\ln(x^2)\right]' = 5\left[\ln(x^2)\right]' = 5 \cdot \frac{1}{x^2} \cdot (x^2)'$$

$$= 5 \cdot \frac{1}{x^2} \cdot 2x$$

$$f(x) = 5^{\cot(3x^2 - \ln 2x)}$$

$$f'(x) = 5^{\cot(3x^2 - \ln 2x)} \cdot \ln 5 \cdot \left[-\csc^2(3x^2 - \ln 2x)\right] \cdot$$

$$\cdot \left[6x - \frac{1}{2x} \cdot 2\right]$$

$$\ln u = \frac{1}{u} \cdot u'$$

$$f(x) = \left(2^{3x}\right) - \left(\log_5\left(e^x - \sin\left(x^3\right)\right)\right) + \left(\operatorname{arcsec} 5x\right)$$

$$f'(x) = \underline{2^{3x} \cdot \ln 2 \cdot 3} - \underline{\frac{e^x - \cos(x^3) \cdot 3x^2}{\left(e^x - \sin(x^3)\right) \cdot \ln 5}} + \underline{\frac{5}{|5x|\sqrt{(5x)^2 - 1}}}$$

2.4 # 7-43, 47-65

5.4 # 39-57

5.5 # 41-55

5.8 # 41-59