(3) חשב את הנגזרות הראשונות והשניות של

הפונקציות הבאות:

א. $f(x) = \dfrac{1+x}{1-x}$

ב. $f(x) = x^2 e^{8x+\cos x}$

ג. $f(x) = 8(x\ln x - x)^3$

ד. $f(x) = x^x$

$$\frac{d}{dx}(\ln x) = \frac{1}{x}$$

$$\frac{d}{dx} a^x = a^x \ln a \quad , \frac{d}{dx} e^x = e^x$$

$$\frac{d}{dx} x^n = n x^{n-1}$$

$$\frac{d}{dx} fg = f\frac{d}{dx}g + g\frac{d}{dx}f$$

$$\frac{d}{dx} f(g) = f' \frac{d}{dx} g$$

* מה שלא מספיקים בתרגול - להמשיך בבית.

$$f(x) = \frac{1+x}{1-x}$$ .ic

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

$$f''(x) = \frac{-4}{(1-x)^3}(-1) = \frac{4}{(1-x)^3}$$

$$f(x) = x^2 e^{8x+\cos x}$$.ט

$$f'(x) = 2x e^{8x+\cos x} + x^2 e^{8x+\cos x}(8-\sin x) =$$

$$= e^{8x+\cos x}\left(2x + 8x^2 - x^2\sin x\right)$$

$$f''(x) = e^{8x+\cos x}\left(2x+8x^2-x^2\sin x\right)\left(8-\sin x\right)$$

$$+ e^{8x+\cos x}\left(2+16x-2x\sin x - x^2\cos x\right)$$

$$f(x) = 8(x\ln x - x)^3$$.ל

$$f'(x) = 24(x\ln x - x)^2(1+\ln x - 1) =$$

$$= 24(x\ln x - x)^2 \ln x$$

$$f''(x) = 48(x\ln x - x)(\ln x)^2 + \frac{24}{x}(x\ln x - x)^2$$

$$f(x) = x^x$$.ג

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

$$f''(x) = x^x(1+\ln x)^2 + x^x\left(\frac{1}{x}\right) = x^x\left((1+\ln x)^2 + \frac{1}{x}\right)$$

תרגיל

א.)

$$\int \sqrt{x}\,dx = \int x^{1/2}\,dx = \frac{2}{3}x^{3/2} + C$$

ב.)

$$\int \frac{1}{x^2}dx = \int x^{-2}dx = -x^{-1} + C = -\frac{1}{x} + C$$

ג.)

$$\int \frac{1+\sqrt{x}}{\sqrt[3]{x}}dx = \int\left(\frac{1}{\sqrt[3]{x}} + \frac{\sqrt{x}}{\sqrt[3]{x}}\right)dx = \int\left(x^{-1/3} + x^{-1/6}\right)dx = \int x^{-1/3}dx + \int x^{-1/6}dx =$$

$$= \frac{3}{2}x^{2/3} + C + \frac{6}{5}x^{5/6} + D = \frac{3}{2}x^{2/3} + \frac{6}{5}x^{5/6} + A$$

$$\sin(a \pm b) = \sin a \cos b \pm \sin b \cos a$$
$$2 \sin a \cos b = \sin(a + b) + \sin(a - b)$$
$$2 \sin(\frac{5\pi}{12} + x) \cos(\frac{5\pi}{12} - x) = \sin \frac{5\pi}{6} - \sin 2x = 0.5 - \sin 2x$$
$$\sin 2x + 0.5 - \sin 2x = 0.5 \Rightarrow \text{any} \quad x$$