Øving 9 Ma0001 Sander Lindberg

Gruppe 3

Oppgave 1:

$$\left(f^{-1}(x)\right)' = \frac{1}{f'(x)}$$

D.V.S $g'(x) = \frac{1}{f'(x)}$

$$g'(0) = \frac{1}{f'(0)} = \frac{1}{-1} = \underline{\underline{-1}}$$

$$g'(1) = \frac{1}{f'(1)} = \frac{1}{-2} = \underline{\underline{-\frac{1}{2}}}$$

Opgave 2:

a) $f(x) = \dfrac{\sin(x) + 2}{x^2 + 1}$

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

$$f'(x) = \frac{x^2\cos(x) + \cos(x) - 2x\sin(x) + 4x}{(x^2+1)^2}$$

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

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

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5) $y \ln(y) = x^3$

$$\left(y \ln(y) = x^3\right)'$$

$$y' \cdot \ln(y) + y(\ln(y))' = 3x^2$$

$$y' \ln(y) + y((\ln(u))' \cdot u') = 3x^2$$

$$y' \ln(y) + y\left(\frac{1}{u} \cdot y'\right) = 3x^2$$

$$y' \ln(y) + y\left(\frac{1}{y} \cdot y'\right) = 3x^2$$

$$y' \ln(y) + \frac{\cancel{y}y'}{\cancel{y}} = 3x^2$$

$$y' \ln(y) + y' = 3x^2$$

$$\frac{y'(\ln(y)+1) = 3x^2}{(\ln(y)+1)}$$

$$\underline{\underline{y' = \frac{3x^2}{\ln(y)+1}}}$$

Oppgave 3:

$$(y^2 + y + x^4 + 3x - 4 = 0)'$$

$$2yy' + y' + 4x^3 + 3 = 0$$

$$\frac{y'(2y+1) = -4x^3 - 3}{2y+1}$$

$$\underline{\underline{y' = -\frac{4x^3 - 3}{2y+1}}}$$

Finner stigningstallet ved å sette punktet inn i den deriverte:

$$y' = -\frac{4 \cdot 1^3 - 3}{2 \cdot (-1) + 1} = -\frac{1}{-1} = \underline{\underline{1}}$$

Finner så tangenten med formelen $y - y_1 = a(x - x_1)$:

$$y + 1 = 1(x - 1)$$

$$y = x - 1 - 1$$

$$\underline{\underline{y = x - 2}}$$

Oppgave 4:

a) $\lim_{x \to 1} \frac{\sin(\pi x)}{x-1}$ | Bruker L'Hôpital:

$$\lim_{x \to 1} \frac{\pi \cos(\pi x)}{1} = +\pi$$

b) $\lim_{x \to 0^+} (e^x - 1)\ln(x) = \frac{e^x - 1}{1} \cdot \frac{\ln(x)}{1}$

$\lim_{x \to 0^+} \frac{\ln(x)}{\frac{1}{e^x - 1}}$ | Bruker L'Hôpital

$\lim_{x \to 0^+} \frac{\frac{1}{x}}{\frac{e^x}{(e^x-1)^2}} = \lim_{x \to 0^+} \frac{e^{-x}(e^x - 1)^2}{x}$ | Bruker L'Hôpital igjen.

$$\lim_{x \to 0^+} - \frac{-e^{-x}(e^x-1)^2 + e^{-x}((2(e^x-1)e^x))}{1}$$

$$\lim_{x \to 0^+} e^{-x}(e^x-1)^2 + e^{-x}((2(e^x-1)e^x)) = 0$$

c) $\lim_{x \to \infty} x^5 5^{-x} = \frac{x^5}{5^x}$.

Ser at $x^5$ vil vokse mye saktere enn $5^x$

Så jeg får ~~Stor~~ $\frac{\text{Lite tall}}{\text{Stort tall}} = 0$