

ARK1

Del 1, uten hjelpemidler.

1 a)  $f(x) = 2x \cos(3x)$   $u = 2x$   $u' = 2$

Produkt  $v = \cos(3x)$   $v' = -\sin(3x) \cdot 3$   
 $v' = -3 \sin(3x)$

$f'(x) = 2 \cos(3x) + 2x(-3 \sin(3x))$

$f'(x) = 2 \cos(3x) - 6x \sin(3x)$

b)  $f(x) = 3(e^{4x+1})^2$  kjemengelen

$f'(x) = 3 \cdot 2(e^{4x+1}) \cdot e^{4x} \cdot 4$

$f'(x) = 24 e^{4x} (e^{4x+1})$

c)  $f(x) = \frac{2}{3}x^3 - 4x^2 + x + 2$

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

$= \frac{2}{3} - 4 + 1 + 2 = -1 + \frac{2}{3} < 0$

Grafen ligger under x-aksen

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

$f'(x) = 2x^2 - 8x + 1$

$f'(1) = 2 \cdot 1^2 - 8 \cdot 1 + 1$

$= 2 - 8 + 1 = -5 < 0$

Grafen synker nær  $x=1$  fordi  $f'(1) < 0$  negativ

f)  $f''(x) = 2 \cdot 2x - 8$

$f''(x) = 4x - 8$

$f''(1) = 4 \cdot 1 - 8 = -4 < 0$

Den momentane vekst hastigheten minsker

d)  $9 + 0,9 + 0,09 + 0,009 + 0,0009 + \dots$

$k = \frac{0,9}{9} = 0,1$

$S = \frac{a_1}{1-k} = \frac{9}{1-0,1} = \frac{9}{0,9} = 10$

e)  $\int \frac{4}{x^2-1} dx$  delbrøkoppspalting

$\frac{4}{x^2-1} = \frac{A}{(x-1)} + \frac{B}{(x+1)}$   $\cdot (x+1)(x-1)$

$4 = A(x+1) + B(x-1)$

$x=1: 4 = A \cdot 2$

$A = 2$

$x=-1: 4 = B \cdot (-2)$

$B = -2$

$\int \frac{4}{x^2-1} dx = \int \left( \frac{2}{x-1} - \frac{2}{x+1} \right) dx$

$= 2 \ln|x-1| - 2 \ln|x+1| + C = 2 \ln \left| \frac{x-1}{x+1} \right| + C$

f)  $f(x) = \frac{24}{\sqrt{x}} = 24x^{-\frac{1}{2}}$

f)  $f'(x) = 24 \left(-\frac{1}{2}\right) x^{-\frac{1}{2}-1}$

$f'(x) = -12x^{-\frac{3}{2}} = -\frac{12}{\sqrt{x^3}} = -\frac{12}{x\sqrt{x}}$

$f'(4) = \frac{24}{\sqrt{4}} = \frac{24}{2} = 12$

$f''(4) = -\frac{12}{4\sqrt{4}} = -\frac{12}{4 \cdot 2} = -\frac{4 \cdot 3}{4 \cdot 2} = -\frac{3}{2}$

Tangenten i punktet (4,12) har st.tallet  $a = -\frac{3}{2}$   
 $y = ax + b$