Oppg. 76-77

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a) $\ln e^2 = \underline{\underline{2}}$

b) $e^{2\ln 2} = (e^{\ln 2})^2 = 2^2 = \underline{\underline{4}}$

c) $\ln e - \ln\sqrt{e} = 1 - \ln e^{1/2} = 1 - \frac{1}{2} = \underline{\underline{\frac{1}{2}}}$

77)

a)
$$4^x = 5$$
$$\ln 4^x = \ln 5$$
$$x \ln 4 = \ln 5$$
$$x = \underline{\underline{\frac{\ln 5}{\ln 4}}}$$

b)
$$5^x = 50$$
$$\ln 5^x = \ln 50$$
$$x \cdot \ln 5 = \ln 50$$
$$x = \underline{\underline{\frac{\ln 50}{\ln 5}}}$$

c)
$$5^{x+1} = 50$$
$$5^x \cdot 5 = 50$$
$$5^x = 10$$
$$\ln 5^x = \ln 10$$
$$x \cdot \ln 5 = \ln 10$$
$$x = \frac{\ln 10}{\ln 5}$$

Vis at
$$\frac{\ln 10}{\ln 5} = \frac{\ln 50}{\ln 5} - 1$$

d)
$$5^{3x+2} = 50$$
$$5^{3x} \cdot 5^2 = 50 \quad \Big| \cdot \frac{1}{25}$$
$$5^{3x} = 2$$
$$\ln 5^{3x} = \ln 2$$
$$3x \cdot \ln 5 = \ln 2$$
$$x = \underline{\underline{\frac{\ln 2}{3\ln 5}}}$$

Oppg. 78

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a) $\ln(x+2) = 8$

$e^{\ln(x+2)} = e^8$

$x+2 = e^8$

$x = \underline{\underline{e^8 - 2}}$

$e^{\ln(x+2)} = x+2$

definisjonen av ln

b) $3\ln\sqrt{x} = 4$

$\ln\sqrt{x} = \frac{4}{3}$

$e^{\ln\sqrt{x}} = e^{\frac{4}{3}}$

$\sqrt{x} = e^{4/3}$

$x = (e^{4/3})^2 = \underline{\underline{e^{8/3}}}$

c) $\ln\left(\frac{x}{e}\right) = 3$

$\ln x - \ln e = 3$

$\ln x - 1 = 3$

$\ln x = 4$

$e^{\ln x} = e^4$

$x = \underline{\underline{e^4}}$

$e^{\ln\left(\frac{x}{e}\right)} = e^3$

osv ...

Oppg. 79

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a) $4e^{2x} = 8 \quad | \cdot \frac{1}{4}$

$e^{2x} = 2$

$\ln e^{2x} = \ln 2$

$2x = \ln 2$

$x = \frac{\ln 2}{2}$

b) $8e^{4x} = 2 \quad | \cdot \frac{1}{8}$

$e^{4x} = \frac{1}{4}$

$4x = \ln \frac{1}{4}$

$x = \frac{\ln 1/4}{4}$

$= \frac{-\ln 4}{4}$

$\ln\left(\frac{a}{b}\right) = \ln a - \ln b$

$\ln \frac{1}{4} = \ln 1 - \ln 4$

$= 0 - \ln 4$

$= -\ln 4$

$\ln \frac{1}{b} = \ln 1 - \ln b$

$= -\ln b$

c) $2e^{-3x} = 1$

$e^{-3x} = \frac{1}{2}$

$-3x = \ln \frac{1}{2}$

$-3x = -\ln 2 \quad | \cdot \frac{-1}{3}$

$x = \frac{\ln 2}{3}$

$\ln \frac{1}{2} = \ln 1 - \ln 2$

$= -\ln 2$

Oppg. 80

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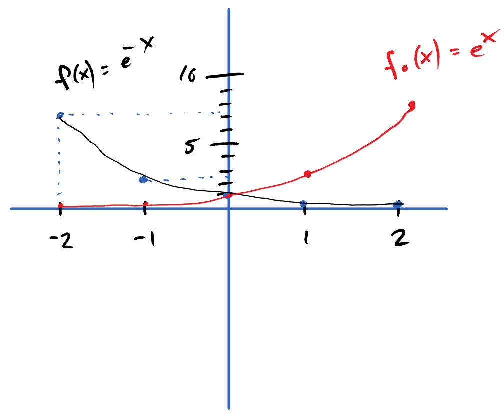
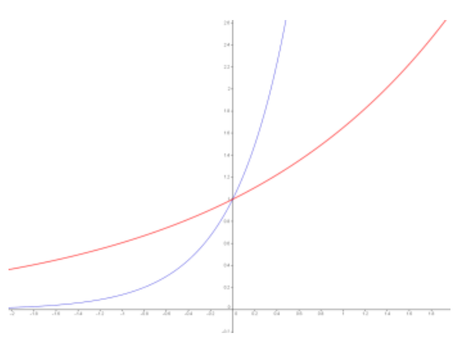
$f(x) = e^{-x}$

x	$f(x)$
-2	$e^{-(-2)} = e^2 \approx 7.4$
-1	$e^1 = e \approx 2.7$
0	$e^0 = 1$
1	$e^{-1} \approx 0.37$
2	$e^{-2} \approx 0.14$



$g(x) = e^{2x}$

$h(x) = e^{\frac{1}{2}x}$



Oppg. 81

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a) $g(x) = e^{2x}$

$g'(x) = e^{2x} \cdot 2 = \underline{\underline{2e^{2x}}}$

$g(x) = f(u(x))$ der

$f(u) = e^u$

$u(x) = 2x$

$g'(x) = f'(u(x)) \cdot u'(x)$

$\boxed{f'(u) = e^u \quad u'(x) = 2}$

$g'(x) = e^{u(x)} \cdot 2$

$= e^{2x} \cdot 2$

$u(x) = 3x^2$

b) $h(x) = e^{3x^2} = e^{u(x)}$

$h'(x) = e^{u(x)} \cdot u'(x)$

$= e^{3x^2} \cdot 6x$

$= \underline{\underline{6x e^{3x^2}}}$

$u'(x) = 6x$

c) $r(x) = \ln|2x| = \ln|u(x)|$

$u(x) = 2x$

$\left[\ln|x| = \frac{1}{x}, \ x \neq 0\right]$

$r'(x) = \frac{1}{u(x)} \cdot u'(x)$

$= \frac{1}{2x} \cdot 2 = \underline{\underline{\frac{1}{x}}}$

Hva med $\int \frac{1}{x}\,dx = \ln|2x| + D$

$= \ln 2 + \ln|x| + D$

$= \ln|x| + \underbrace{\ln 2 + D}_{\text{"}C\text{"}}$

d) $s(x) = \ln\sqrt{x} = \ln u(x)$

$u(x) = \sqrt{x} = x^{1/2} \geq 0$

$u'(x) = \frac{1}{2}x^{-1/2}$

$= \frac{1}{2\sqrt{x}}$

$s'(x) = \frac{1}{u(x)} \cdot u'(x)$

$= \frac{1}{\sqrt{x}} \cdot \frac{1}{2\sqrt{x}} = \underline{\underline{\frac{1}{2x}}}$

$\boxed{(uv)' = u'v + uv'}$

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

$= (x)' \cdot e^{2x} + x \cdot (e^{2x})'$ se a)

$= 1 \cdot e^{2x} + x(2e^{2x})$

$= \underline{\underline{e^{2x}(1 + 2x)}}$

Oppg. 83

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a) $\int \frac{1}{x+2}\,dx = \int \frac{1}{u}\,du = \ln|u| + C$

$= \ln|x+2| + C$

$$\boxed{\begin{aligned} u &= x+2 \\ \frac{du}{dx} &= 1 \\ du &= dx \end{aligned}}$$

b) $\int \frac{2x}{x^2+1}\,dx = \int \frac{1}{u}\cdot du = \ln|u| + C$

du

u

$= \ln|x^2+1| + C$

$= \ln(x^2+1) + C$

$$\boxed{\begin{aligned} u &= x^2+1 \\ \frac{du}{dx} &= 2x \\ du &= 2x\,dx \end{aligned}}$$

c) velg $u = x^2$ og bruk substitusjon

Oppg. 82

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b) $\int x e^x \, dx = \overset{u \cdot v}{x \cdot e^x} - \int \overset{u' \cdot v}{1 \cdot e^x} \, dx$

$\boxed{\int u \cdot v' = u \cdot v - \int u' v}$

$\boxed{\begin{array}{ll} u = x & u' = 1 \\ v' = e^x & v = e^x \end{array}}$

$= xe^x - \int e^x \, dx$

$= xe^x - e^x + C$

$\underline{\underline{= e^x(x-1) + C}}$

c) $\int \frac{x}{e^{3x}} \, dx = \int x \cdot e^{-3x} \, dx$

$\boxed{\begin{array}{ll} u = x & u' = 1 \\ v' = e^{-3x} & v = -\frac{1}{3} e^{-3x} \end{array}}$

bruk substitusjon til å vise at

$\int e^{-3x} \, dx$

$= -\frac{1}{3} e^{-3x} + C$

velg $u = -3x$

osv...

$= -\frac{x}{3} e^{-3x} - \int \frac{-1}{3} e^{-3x} \, dx$

$= \frac{-x}{3} e^{-3x} + \frac{1}{3} \int e^{-3x} \, dx$

$= \frac{-x}{3} e^{-3x} + \frac{1}{3} \cdot \frac{-1}{3} e^{-3x} + D$

$\underline{\underline{= \frac{-x}{3} e^{-3x} - \frac{1}{9} e^{-3x} + D}}$