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1) a) $\int (x-2)\,dx = \int x - 2\int dx$

$= \frac{x^2}{2} - 2x$

b) $\int \frac{2}{(x-9)^2}\,dx = \int 2 \cdot u^{-2} \cdot du = 2 \cdot \frac{u^{-1}}{-1}$

$u = x-9 \rightarrow \frac{du}{dx} = 1$

$= -\frac{2}{(x-9)} + C$

c) $x^2\sqrt{1-x}\,dx = \int x^2 \cdot u^{-1/2} \cdot \frac{du}{-1}$

$u = 1-x$

$\frac{du}{dx} = -1$

$= -\frac{x^3}{3} \cdot -\frac{u^{1/2}}{1/2} + C = -\frac{x^3}{3} \cdot -\sqrt{1-x} + C$

d) $\int x^2 \sqrt{1-x}\, dx = \int x^2 \cdot u^{1/2} \cdot -du$

$u = 1-x$

$\frac{du}{dx} = -1$

$= -\frac{x^3}{3} \cdot \frac{-u^{3/2}}{3/2} + C = \frac{-x^3}{3} \cdot \frac{-\sqrt{(1-x)^3}}{3/2} + C = \frac{-x^3 \cdot -\sqrt{(1-x)^3}}{3} + C$

e) $\int \frac{e^x}{1+e^x}\, dx = e^x \cdot u^{-1/2} \cdot \frac{du}{e^x} = u^{1/2} + C = \sqrt{1+e^x} + C$

$u = 1+e^x$

$\frac{du}{dx} = e^x$

2) a) $\int_0^4 \sqrt{2x+1}\, dx = \int_0^4 u^{1/2} \cdot \frac{du}{2} = \frac{u^{1/2}}{2} = \left. \frac{\frac{u^{3/2}}{2}}{3/2} \right]_0^4$

$u = 2x+1$

$\frac{du}{dx} = 2$

$= \frac{u^{3/2}}{\cancel{2}} \cdot \frac{\cancel{2}}{3} = \sqrt{(2x+1)^3} \cdot \frac{1}{3}$

$= 9 - 0 = 9$

2) b) $\int_0^2 e^{-2x}\, dx = \int_0^2 u \cdot \frac{du}{2 \cdot e^{-2x}} = \left. \frac{\frac{u^2}{2 \cdot e^{-2x}}}{2} \right]_0^2$

$u = e^{-2x}$

$\frac{du}{dx} = 2 \cdot e^{-2x}$

$= \frac{u^2}{2 \cdot e^{-2x}} \cdot 2 = \frac{2 \cdot e^{-2x}}{2 \cdot e^{-2x}} = \frac{e^{-2x}}{e^{-2x}} = 1 - 0 = 1$

c) $\int_0^4 \frac{x}{\sqrt{2x+1}}\, dx = \int x \cdot u^{1/2} \cdot \frac{du}{2} = \frac{\frac{x^2}{2} \cdot \frac{u^{1/2}}{1/2}}{2}$

$u = 2x+1$

$\frac{du}{dx} = 2$

$= \frac{x^2}{2} \cdot u^{1/2} \cdot 2 \cdot 2 = \left. \frac{x^2}{2} \cdot \sqrt{2x+1} \cdot 4 \right]_0^4 = 96 - 0 = 96$

2) d) $\int_{1}^{2} (x-1)\sqrt{2-x}\, dx = \int_{1}^{2} (x-1) \cdot U^{1/2} \cdot \frac{du}{-1}$

$U = 2 - x$

$\frac{du}{dx} = -1$

$= 1 \cdot \frac{-x^2}{2} \cdot \frac{-U^{3/2}}{3/2} = \frac{-x^2}{2} \cdot -\sqrt{(2-x)^3} \cdot \frac{2}{3} = \frac{-x^2 \cdot -\sqrt{(2-x)^3}}{3} \Big]_{1}^{2}$

$= 0 - 0{,}33 = -0{,}33$

2) e) $\int_{-2}^{0} -x \cdot \sqrt{x+2}\, dx = \int -x \cdot U^{1/2} \cdot du = \frac{-x^2}{2} \cdot U^{3/2}$

$U = x + 2$

$\frac{du}{dx} = 1$

$= \frac{-x^2}{2} \cdot \sqrt{(x+2)^3} \Big]_{-2}^{0} = 0 - 0 = 0$

integral por partes $\int u \, dv = u \cdot v - \int v \, du$

3) a) $\int \ln(2x) \, dx = \ln(2x) \cdot x - \int x \cdot \frac{1}{x} \, dx$

$\int u \, dv = uv - \int v \, du$

$= x \ln(2x) - x + C$

escolhas $\begin{cases} u = \ln(2x) \rightarrow du = \frac{1}{2x} \cdot 2 \cdot dx \\ dv = dx \end{cases}$

$v = x$

prova: $(x \cdot \ln(2x) - x + C)'$
$= x \cdot \frac{1}{2x} \cdot 2 + 1 \ln(2x) - 1 + 0$
$= \ln(2x)$

3) e) $\int x \cdot e^{-x} \, dx = x \cdot (-e^{-x}) - \int -e^{-x} \, dx = -e^{-x} \cdot x + \int e^{-x} \, dx$
$= -e^{-x} \cdot x - e^{-x} + C$
$= -e^{-x}(x+1) + C$

$u = x$
$dv = e^{-x} dx$

$v = -e^{-x} + C$

$\int dv = \int e^{-x} \, dx = \int e^{t} \, -dt$
$t = -x$ $\quad = -\int e^{t} \, dt$
$\frac{dt}{dx} = -1$ $\quad = -e^{t} + C$
$= -e^{-x} + C$

prova:

$(-e^{-x} \cdot (x+1))' = e^{-x}(x+1) + (-e^{-x}) \cdot 1$
$= e^{-x} x + \cancel{e^{-x}} - \cancel{e^{-x}}$
$= e^{-x} \cdot x$

3) b)

	D	I
$+$	x^2	e^{2x}
$-$	$2x$	$\frac{1}{2}\cdot e^{2x}$
$+$	2	$\frac{1}{4}\cdot e^{2x}$
$-$	0	$\frac{1}{8}\cdot e^{2x}$

$$x^2\cdot\frac{1}{2}e^{2x} - 2x\cdot\frac{1}{4}\cdot e^{2x} + 2\cdot\frac{1}{8}\cdot e^{2x} + C$$

$$x^2\cdot\frac{1}{2}e^{2x} - \frac{1}{4}\cdot\left(2x\cdot e^{2x} + e^{2x}\right) + C$$

$$\int \frac{1}{2}\cdot e^{2x}\,dx = \frac{1}{2}\cdot\frac{1}{2}e^{2x} = \frac{1}{4}e^{2x}$$

$$\int \frac{1}{4}e^{2x} = \frac{1}{4}\cdot\frac{1}{2}\cdot e^{2x} = \frac{1}{8}\cdot e^{2x}$$

$\int u\,dv = u.v - \int v.\,du$

3) d) $\int x(x+1)^2\,dx$

$u = (x+1)^2 \rightarrow du = 2.(x+1).1\,dx$

$dv = x.dx$

$v = \frac{x^2}{2}$

$= (x+1)^2.\frac{x^2}{2} - \int \frac{x^2}{\cancel{2}}.\cancel{2}.(x+1)\,dx$

$= (x+1)^2.\frac{x^2}{2} - \int (x^3+x^2).dx$

$= (x+1)^2.\frac{x^2}{2} - \left(\frac{x^4}{4} + \frac{x^3}{3}\right) + C$

3) C) $x^2 \ln x\,dx = \ln x.\frac{x^3}{3} - \int \frac{x^{\cancel{3}\,2}}{3}.\frac{1}{\cancel{x}}\,dx$

$u = \ln x$	$\overbrace{\int \frac{1}{3}.x^2.dx}$
$dv = x^2\,dx$	$= \ln x.\frac{x^3}{3} - \frac{1}{3}.\frac{x^3}{3} + C$
$v = \frac{x^3}{3}$	$= \frac{x^3}{3}\left(\ln x - \frac{1}{3}\right) + C$
$du = \frac{1}{x}$	

$\int u\,dv = u.v - \int v.du$

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4) a) $\int_0^1 \ln(1+2x)\,dx = \ln(1+2x).x - \int x.\frac{1}{1+2x}.2.dx$

$u = \ln(1+2x)$

$dv = dx$

$v = x$

$du = \frac{1}{1+2x}.2.dx$

$u = 1+2x \Rightarrow \frac{u-1}{2} = x$

$\int \frac{u-1}{2}.\frac{1}{u}\frac{du}{2}$

$= \frac{1}{4}\int \frac{u}{u} - \frac{1}{u}\,du$

$= \frac{1}{4}\int\left(1-\frac{1}{u}\right)du = \frac{1}{4}(u - \ln u)$

$= \ln(1+2x).x - 2\int x.\frac{1}{1+2x}\,dx$

$= \int \ln(1+2x)\,dx$

$= \ln(1+2x).x - \cancel{2}.\frac{1}{\cancel{4}}.(u - \ln u)\Big]_0^1$

$= \ln(1+2x).x - \frac{1}{2}\left(1+2x - \ln(1+2x)\right)\Big]_0^1$

$= \ln(1+2).1 - \frac{1}{2}\left(1+2 - \ln(1+2)\right)$
$- \left(\ln(1+0).0 - \frac{1}{2}(1+0-\ln(1+0))\right)$

$= \ln 3 - \frac{1}{2}(3 - \ln 3) - \left(-\frac{1}{2}\right)$

$= 1{,}09 - 1{,}5 + 0{,}54 + 0{,}5$

$= 0{,}6479$

4) b) $\int_0^2 \frac{x^2}{e^x} = x^2 \cdot -e^{-x} - \int -e^{-x} \cdot 2x\,dx$

$u = x^2 \rightarrow du = 2x\,dx$

$dv = e^{-x} \rightarrow v = -e^{-x}$

$\int e^{-x}\,dx = \int e^{h}\,dx$

$= e^{h} \cdot -1$

$h = -x$

$= -e^{-x} + C$

$dx = -dh$

$-\int -e^{-x} \cdot 2x\,dx$

$-2 \cdot \int -e^{t} \cdot x\,dx$

$-2 \cdot e^{-x} \cdot \frac{x^2}{\cancel{2}} = -e^{-x} \cdot x^2$

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

$= -2e^{-2} - (-2e^{0}) = -0,27068 + 2 = 1,72932$

4) c) $\int_1^e x^9 \ln x\,dx = \ln x \cdot \frac{x^{10}}{10} - \int \frac{x^{10}}{10} \cdot \frac{1}{x}\,dx$

$u = \ln x \rightarrow du = \frac{1}{x}\,dx$

$dv = x^9\,dx \rightarrow v = \frac{x^{10}}{10}$

$= \ln x \cdot \frac{x^{10}}{10} - \frac{1}{10}\int x^9\,dx$

$= \ln x \cdot \frac{x^{10}}{10} - \frac{1}{10} \cdot \frac{x^{10}}{10}$

$= \ln e \cdot \frac{e^{10}}{10} - \frac{1}{10} \cdot \frac{e^{10}}{10} - \left(\ln 1 \cdot \frac{1}{10} - \frac{1}{10} \cdot \frac{1^{10}}{10}\right)$

$= 1 \cdot \frac{e^{10}}{10}\left(1 - \frac{1}{10}\right) + \frac{1}{100} = 1982,3879 + 0,01$

$= 1982,3979$