HW18E: 2bdh, 3ad, 4cd, 6

2b.) x^3e^{-x} $u=x^3$ $v=e^{-x}$ $u'=3x^2$ $v'=-e^{-x}$ $\therefore \boxed{3x^2e^{-x}-x^3e^{-x}}$

2d.) $\frac{x}{e^x}$ $u=x$ $v=e^x$ $u'=1$ $v'=e^x$ $\therefore \frac{e^x-xe^x}{(e^x)^2} \Rightarrow \frac{e^x(1-x)}{e^{2x}} \Rightarrow \boxed{\frac{1-x}{e^x}}$

2h.) $\frac{e^x+2}{e^{-x}+1}$ $u=e^x+2$ $v=e^{-x}+1$ $u'=e^x$ $v'=-e^{-x}$ $\therefore \frac{e^x(e^{-x}+1)+e^{-x}(e^x+2)}{(e^{-x}+1)^2}$

$\Rightarrow \frac{e^0+e^x+e^0+2e^{-x}}{(e^{-x}+1)^2} \Rightarrow \frac{1+e^x+1+2e^{-x}}{(e^{-x}+1)^2}$ $\boxed{\frac{2+e^x+2e^{-x}}{(e^{-x}+1)^2}}$

3a.) $(2+e^x)^4$ $y=u^4$ $u=2+e^x$ $y'=4u^3$ $u'=e^x$ $\therefore \boxed{4e^x(2+e^x)^3}$

3d.) $\frac{1}{\sqrt{e^{2x}+2}}$ $y=u^{-\frac{1}{2}}$ $u=e^{2x}+2$ $y'=\frac{-1}{2u^{3/2}}$ $u'=2e^{2x}$ $\therefore \frac{-2e^{2x}}{2(e^{2x}+2)^{3/2}} \Rightarrow \boxed{\frac{-e^{2x}}{(e^{2x}+2)^{3/2}}}$

4c.) $y=\sqrt{e^{2x}+10}$ at $x=\ln 3$ $y=u^{\frac{1}{2}}$ $u=e^{2x}+10$ $y'=\frac{1}{2\sqrt{u}}$ $u'=2e^{2x}$

$\frac{dy}{dx}=\frac{2e^{2x}}{2\sqrt{e^{2x}+10}}=\frac{e^{2x}}{\sqrt{e^{2x}+10}}$

$\therefore \frac{e^{2(\ln 3)}}{\sqrt{e^{2(\ln 3)}+10}}=\frac{e^{\ln 3^2}}{\sqrt{e^{\ln 3^2}+10}}=\frac{e^{\ln 9}}{\sqrt{e^{\ln 9}+10}}=\frac{9}{\sqrt{9+10}}=\boxed{\frac{9}{\sqrt{19}}}$

4d.) $y=\frac{2-x}{e^{3x}}$ at $x=1$ $u=2-x$ $v=e^{3x}$ $u'=-1$ $v'=3e^{3x}$ $y'=\frac{-e^{3x}-3e^{3x}(2-x)}{(e^{3x})^2}$

$\Rightarrow \frac{-e^3-3e^3(2-1)}{(e^3)^2} \Rightarrow \frac{-e^3-3e^3}{e^6} \Rightarrow \frac{-4e^3}{e^6}=\boxed{\frac{-4}{e^3}}$

6.) $f(x)=e^{kx}+x$ $f'(0)=-8$, find k.

$f'(x)=ke^{kx}+1$ $\therefore -8=k+1 \rightarrow \boxed{k=-9}$