1) $\int_{-2}^{2} \frac{1}{2}x + 5\,dx \Rightarrow \int_{-2}^{2} \frac{1}{2}\,x\,dx + \int_{-2}^{2} 5\,dx \Rightarrow$

$\Rightarrow \frac{1}{2}\int_{-2}^{2} x\,dx + \int_{-2}^{2} 5\,dx \Rightarrow \frac{1}{2}\int_{-2}^{2} \frac{x^{1+1}}{1+1}dx + \left[5x\right]_{-2}^{2} \Rightarrow$

$\Rightarrow \frac{1}{2}\left[\frac{x^2}{4}\right]_{-2}^{2} + \left[5x\right]_{-2}^{2} \Rightarrow 0 + 20$

$\int_{-2}^{2} e^{x/2}dx \Rightarrow u = x:2 \Rightarrow 2\int_{-2}^{2} e^{u}\,du \Rightarrow 2.\left[e^{u}\right]_{-2}^{2} \Rightarrow$

$\Rightarrow 2.\left[e^{x/2}\right]_{-2}^{2} \Rightarrow 2.(e^{2/2} - e^{-2/2}) \Rightarrow 4{,}7$

$20 - 4{,}7 = 15{,}3$ u.a

2) $\displaystyle\int_1^2 \pi\,(2x^2-2)^2\,dx = \pi\int_1^2 (4x^4 - 8x^2 + 4)\,dx$

$$\Rightarrow \pi\left[\frac{4x^5}{5} - \frac{8x^3}{3} + 4x\right]_1^2$$

$$\Rightarrow \pi\left[\frac{128}{5} - \frac{64}{3} + 8 - \left(\frac{4}{5} - \frac{8}{3} + 4\right)\right]$$

$$\Rightarrow \pi\left[\frac{128}{5} - \frac{64}{3} + 8 - \frac{4}{5} + \frac{8}{3} - 4\right]$$

$$\Rightarrow \pi\left[\frac{152}{15}\right] \qquad V = \frac{152\pi}{15}\ \text{u.v} \approx 31{,}8\ \text{u.v}$$

3) $\frac{d}{dx}\left(\frac{4}{e^{3x}}\right) \Rightarrow \frac{4d}{dx}\left(\frac{1}{e^{3x}}\right) \Rightarrow \frac{4d}{dx}\left(e^{-3x}\right) \Rightarrow$

$\Rightarrow 4e^{-3x}\frac{d}{dx}(-3x) \Rightarrow 4e^{-3x}(-3) \Rightarrow -12e^{-3x}$

$\frac{d}{dx}\left(3x\ \operatorname{arctg}\left(\frac{x}{3}\right)\right) \Rightarrow \frac{3d}{dx}\left(x \cdot \operatorname{arctg}\left(\frac{x}{3}\right)\right) \Rightarrow$

$\Rightarrow 3\left(\frac{d}{dx}(x) \cdot \operatorname{arctg}\left(\frac{x}{3}\right) + \frac{d}{dx}\left(\operatorname{arctg}\left(\frac{x}{3}\right)\right)x\right) \Rightarrow$

$\Rightarrow 3\left(\operatorname{arctg}\left(\frac{x}{3}\right) + \frac{d}{dx}\left(\operatorname{arctg}\left(\frac{x}{3}\right)\right)x\right)$

$\frac{1}{(x/3)^2+1} \cdot \frac{d}{dx}\left(\frac{x}{3}\right) \Rightarrow \frac{1}{(x/3)^2+1} \cdot \frac{1}{3} \Rightarrow \frac{3}{x^2+9} \Rightarrow$

$\Rightarrow 3\left(\operatorname{arctg}\left(\frac{x}{3}\right) + \frac{3x}{x^2+9}\right)$

$\frac{d}{dx}\left(\ln(9x^4+5)\right) \Rightarrow \frac{1}{9x^4+5} \cdot \frac{d}{dx}(9x^4+5) \Rightarrow \frac{1}{9x^4+5} \cdot 36x^3 \Rightarrow \frac{36x^3}{9x^4+5}$

$-12e^{-3x} + 3\left(\operatorname{arctg}\left(\frac{x}{3}\right) + \frac{3x}{x^2+9}\right) + \frac{36x^3}{9x^4+5}$

4) $\lim_{x \to 0} \frac{e^{x} - 1 - x - \frac{1}{2}x^2}{x^3}$

$\lim_{x \to 0} \frac{e^{x} - 1 - x}{3x^2}$

$\lim_{x \to 0} \frac{e^{x} - 1}{6x}$

$\lim_{x \to 0} \frac{e^{x}}{6} = \frac{1}{6} \cong 0,17$

5) a) $\int x \operatorname{sen}(4x)\,dx$

$f(x) = \operatorname{sen}(4x) \quad g'(x) = x \quad f(x) = -\frac{1}{4}\cos(4x)$

$-\frac{1}{4} x \cos(4x) - \int -\frac{1}{4}\cos(4x)$

$-\frac{1}{4} x \cos(4x) + \frac{1}{16}\operatorname{sen}(4x) + C$ //

5) b) $\int \frac{1}{(x/3+67)^{25}}\,dx = \int \frac{1}{u^{25}}\,du = 3\int u^{-25} = 3\int \frac{u^{-24}}{-24}$

$u = \frac{x}{3} + 67$

$3 \cdot \frac{\left(\frac{x}{3}+67\right)^{-24}}{-24} = 3 \cdot \frac{\left(\frac{x+201}{3}\right)^{-24}}{-24} = 3 - \frac{3^{24}}{24(x+201)^{24}}$

$3 - \frac{3^{24}}{2^3(x+201)^{24}} = -\frac{3^{24}}{8(x+201)^{24}} + C$ //

5) c) $\int \frac{x-9}{x^2+5x-14}\,dx = \frac{x-9}{(x-2)(x+7)}$

$\int \frac{A}{(x-2)} + \int \frac{B}{(x+2)} \qquad \frac{A(x+7)+B(x-2)}{(x-2)(x+7)} = x-9$

$A = \frac{-7}{9} \quad B = \frac{16}{9}$

$\begin{cases} Ax + Bx = x \\ 7A - 2B = -9 \end{cases} \qquad \begin{cases} 2A + 2B = 2 \\ 7A - 2B = -9 \end{cases}$

$\int \frac{-7}{9}\frac{1}{(x-2)} + \int \frac{16}{9}\frac{1}{(x+7)} = -7/9 \ln|x-2| + 16/9 \ln|x+7| + C$ //

$$5)\ d)\ \int_1^{+\infty} \frac{1}{(5+3x)^3}\,dx \Rightarrow \lim_{A\to+\infty}\int_1^A \frac{1}{(5+3x)^3}\,dx \quad U=5+3x$$

$$\frac{1}{3}\lim_{A\to+\infty}\int_1^A \frac{1}{U^3}\,dU \Rightarrow \frac{1}{3}\lim_{A\to+\infty}\int_1^A \frac{U^{-2}}{-2}\,dU \to \frac{1}{3}\left[\frac{1}{2(5+3x)^2}\right]_1^A$$

$$\frac{1}{3}\lim_{A\to+\infty}\left(-\frac{1}{2(5+3(\infty))^2}+\frac{1}{28}\right)=\frac{1}{384}$$