Review WU:

1) $y = \ln\sqrt{x^3+x^2+1}$

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

$$y' = \frac{3x^2+2x}{2(x^3+x^2+1)}$$

2) $y = \dfrac{\sqrt{x+1}\,(2-x)^3}{(x+5)^8}$

$$\ln y = \ln\left(\frac{\sqrt{x+1}\,(2-x)^3}{(x+5)^8}\right)$$

$$\ln y = \ln\sqrt{x+1} + \ln(2-x)^3 - \ln(x+5)^8$$

$$\ln y = \frac{1}{2}\ln(x+1) + 3\ln(2-x) - 8\ln(x+5)$$

$$y\left(\frac{1}{y}\frac{dy}{dx}\right) = \left(\frac{1}{2(x+1)} - \frac{3}{2-x} - \frac{8}{x+5}\right) y$$

$$\frac{dy}{dx} = \left(\frac{1}{2(x+1)} - \frac{3}{2-x} - \frac{8}{x+5}\right)\left(\frac{\sqrt{x+1}\,(2-x)^3}{(x+5)^8}\right)$$

3)
$$\begin{array}{r|rrrr} 2 & 1 & -3 & 0 & 8 \\ & \downarrow & 2 & -2 & -4 \\ \hline & 1 & -1 & -2 & 4 \end{array}$$

$$\int x^2 - x - 2 + \frac{4}{x-2}\,dx$$

$$= \frac{x^3}{3} - \frac{x^2}{2} - 2x + 4\ln|x-2| + C$$

4) $\int \frac{1-3y}{\sqrt{2y-3y^2}}\,dy$

$u = 2y - 3y^2$
$du = (2-6y)\,dy$
$\frac{1}{2}du = (1-3y)\,dy$

$\frac{1}{2}\int u^{-1/2}\,du$

$= \cancel{\frac{1}{2}\cdot 2}\, u^{1/2} = u^{1/2} + c = \sqrt{2y-3y^2} + C$

5) $\int \frac{6x+1}{3x}\,dx = \int \frac{6x}{3x}\,dx + \int \frac{1}{3x}\,dx$

$= \int 2\,dx + \frac{1}{3}\int \frac{1}{x}\,dx = 2x + \frac{1}{3}\ln|x| + c$

6) $\int_1^{e^6} \frac{\sqrt{\ln x}}{x}\,dx$

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

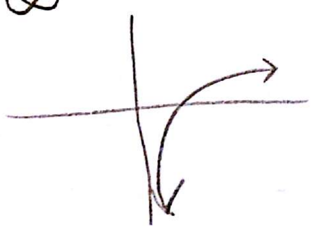
$u(1) = \ln 1 = 0$
$u(e^6) = \ln e^6 = 6$

$\int_0^6 u^{1/2}\,du = \frac{2}{3}u^{3/2}\Big|_0^6 = \frac{2}{3}(6)^{3/2} - 0$

$\frac{2}{3}\cdot(\sqrt{6})^3$

7) $\lim_{x\to 6^-} \ln(6-x) = -\infty$

$\ln(\text{small})$



8) $g(x) = \int_1^{\ln\sqrt{x}} (t^3+3)\,dt$

$g'(x) = \left((\ln\sqrt{x})^3 + 3\right)\cdot \frac{1}{\sqrt{x}} \cdot \frac{1}{2}x^{-1/2}$

$\left((\ln\sqrt{x})^3 + 3\right)\cdot\left(\frac{1}{2x}\right)$

9) $\displaystyle\int \frac{x+1}{x^2+2x+1}\,dx = \int \frac{x+1}{(x+1)^2}\,dx = \int \frac{1}{x+1}\,dx$

$= \ln|x+1| + c$

10) $\dfrac{dy}{dx} = \dfrac{2x}{x^2-9}$ $(0,4)$

$\displaystyle\int dy = \int \frac{2x}{x^2-9}\,dx$ $\quad u = x^2-9$, $du = 2x\,dx$

$y = \displaystyle\int \frac{1}{u}\,du$

$y = \ln|x^2-9| + c$

$4 = \ln|0-9| + c$

$4 = \ln 9 + c$

$c = 4 - \ln 9$

$y = \ln|x^2-9| + 4 - \ln 9$

12) $\displaystyle\int_0^1 \frac{1-\cos x}{x-\sin x}\,dx$

$u = x - \sin x$

$du = (1-\cos x)\,dx$

$u(0) = 0-0=0$

$u(1) = 1-\sin 1$

$\displaystyle\int_0^{1-\sin 1} \frac{1}{u}\,du$

$\ln|u| \Big|_0^{1-\sin 1}$

$\cancel{\ln|1-\sin 1| - \ln 0}$

no solution

11) $y^2 + \ln(xy) = 2$ $(e,1)$

$\ln x + \ln y$

$2y\dfrac{dy}{dx} + \dfrac{1}{x} + \dfrac{1}{y}\dfrac{dy}{dx} = 0$

$\dfrac{dy}{dx}\left(2y + \dfrac{1}{y}\right) = -\dfrac{1}{x}$

$\dfrac{dy}{dx} = \dfrac{-1}{x\left(2y+\frac{1}{y}\right)}$

$\dfrac{-1}{e(2+1)} = -\dfrac{1}{3e}$

$y - 1 = -\dfrac{1}{3e}(x-e)$