Cal II (S) (Maths 201–NYB)

1. The integrals:

   (a) $-\tan(\frac{1}{x}) + C$ (b) $\sqrt{x^2-1} - \operatorname{arcsec} x + C$ (c) $\frac{1}{2}(2+3x)^{2/3} + C$

   (d) $\frac{1}{3}\ln^3 t + C$ (e) $x\ln^2 x - 2x\ln x + 2x + C$ (f) $-\cot\theta - \csc\theta + C$

   (g) $\frac{1}{2}\ln 2 + \frac{7\pi^2}{288}$ (h) $2\sqrt{x} + 2\,\mathrm{e}^{\sqrt{x}} + C$ (i) $\frac{1}{3}x^2\,\mathrm{e}^{3x} - \frac{2}{9}x\,\mathrm{e}^{3x} + \frac{2}{27}\,\mathrm{e}^{3x} + C$

   (j) $\ln|\sec(1+x)| + C$ (k) $\sqrt{x^2+2x-3} + C$ (l) $\frac{\mathrm{e}^x}{5}(2\sin 2x + \cos 2x) + C$

   (m) $\dfrac{2\pi}{3} - \dfrac{\sqrt{3}}{2}$ (n) $-12 + \frac{20\sqrt{5}}{3}$ (o) $\sqrt{4x^2-9} - 3\arctan\left(\frac{\sqrt{4x^2-9}}{3}\right) + C$

2. The derivatives:

   (a) $y' = \dfrac{(1-\sin x)\arccos(x) + (x+\cos x)(1-x^2)^{-1/2}}{(\arccos(x))^2}$

   (b) $y' = \sec x\tan x\operatorname{arcsec} x + \dfrac{\sec x}{x\sqrt{x^2-1}}$

3. Simplified: (a) $\frac{\sqrt{40}}{7}$ (b) $\sqrt{1+x^2}$

4. (a) Any x between $-\frac{\pi}{2}$ and $\frac{\pi}{2}$ will satisfy $\arcsin(\sin x) = x$; no x outside that range will, since the range of $\arcsin x$ is $[-\frac{\pi}{2}, \frac{\pi}{2}]$.

   (b) Any x between -1 and 1 will satisfy $\sin(\arcsin x) = x$; no x outside that range will, since the domain of $\arcsin x$ is $[-1, 1]$.