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Test 1
(version B)

Cal II (S) (Maths 201–NYB)

1. The integrals:

(a) $\frac{\pi}{3} - \frac{\sqrt{3}}{2}$ (b) $\frac{1}{4}(25 - x^2)^{-2} + C$ (c) $\frac{1}{5}(x^2+4)^{5/2} - \frac{4}{3}(x^2+4)^{3/2} + C$

(d) $\frac{1}{3}\ln|1 + e^{3x}| + C$ (e) $\frac{1}{2}\tan 2x + \frac{1}{6}\tan^3 2x + C$ (f) $\frac{1}{2}x^2 \operatorname{arcsec}(x) - \frac{1}{2}\sqrt{x^2-1} + C$

(g) $\frac{1}{3}\arctan(e^{3x}) + C$ (h) $\tan(t) - \ln|\sec(t) + \tan(t)| + C$ (i) $\ln|x + \sqrt{x^2-1}| + C$

(j) $\frac{1}{8}e^{2x}(4x^3 - 6x^2 + 6x - 3) + C$ (k) $2\ln(\sqrt{x} + 1) + C$ (l) $-2(\sec t)^{-1/2} + C$

(m) $-\frac{1}{24}\cos^{12} 2t + \frac{1}{28}\cos^{14} 2t + C$ (n) $\frac{1}{5}e^{2x}(2\sin x - \cos x) + C$

(o) $\frac{\pi}{4} - \frac{1}{2}\ln 2$

2. The derivatives:

(a) $\dfrac{-\frac{\arcsin x}{\sqrt{1-x^2}} - \frac{\arccos x}{\sqrt{1-x^2}}}{\arcsin^2 x} = -\dfrac{\arcsin x + \arccos x}{\sqrt{1-x^2}\,\arcsin^2 x}$

(b) $\dfrac{\tan x}{1+x^2} + \arctan(x)\sec^2 x$

3. Simplified: (a) $5/13$ (b) $\sqrt{x^2-1}$
(c) $\cos\theta = \pm 3/\sqrt{10}$ but $\cos\left(\arctan\left(-\frac{1}{3}\right)\right) = 3/\sqrt{10}$. In the former case, θ could be in QII or QIV, but in the latter case, it must be in QIV, where cos is positive.

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 $[-1, 1]$.