

## Calculus II (Maths 201–NYB)

## The Answers:

## 1. The integrals:

- (a)  $-\frac{1}{3} \csc^3 x + 2 \csc x + \sin x + C$       (b)  $-\frac{1}{2} \frac{1}{x+1} + \frac{3}{4} \ln|x+1| + \frac{1}{4} \ln|x-1| + C$   
 (c)  $-\frac{3}{2}(\cot x)^{2/3} - \frac{3}{8}(\cot x)^{8/3} + C$       (d)  $\frac{x}{8} - \frac{1}{8} \sin x + C$   
 (e)  $\frac{2}{3} \ln|x| + \frac{1}{3} \ln|x-3| + C$       (f)  $\frac{1}{18} \frac{x}{x^2+9} + \frac{1}{54} \arctan(\frac{x}{3}) + C$   
 (g)  $\frac{1}{4} \ln|x-1| - \frac{1}{4} \ln|x+1| - \frac{1}{2} \arctan(x) + C$   
 (h)  $\frac{1}{4} \tan^4 x + \frac{1}{6} \tan^6 x + C = \frac{1}{6} \sec^6 x - \frac{1}{4} \sec^4 x + C$   
 (i)  $\ln|\arcsin(x)| + C$       (j)  $x^2 + 2x + \frac{53}{7} \ln|x-3| + \frac{3}{7} \ln|2x+1| + C$   
 (k)  $\frac{1}{4} e^{2x}(2x^2 - 2x + 1) + C$       (l)  $\frac{1}{x} + \ln|x| + 2 \arctan(x) + C$   
 (m)  $\frac{\pi}{2} - \frac{4+\pi}{4\sqrt{2}}$       (n)  $\frac{x}{2}(\sin(\ln x) + \cos(\ln x)) + C$   
 (o)  $\frac{2\sqrt{2}}{3} - \frac{8}{9\sqrt{3}}$

## 2. Improper integrals:

- (a) diverges      (b)  $\frac{3}{2}(2^{2/3} - 1)$       (c)  $2/e$   
 (d) diverges      (e)  $\frac{1}{2} \ln 3$

## 3. Limits:

- (a)  $1/2$       (b)  $0$       (c)  $1/2$   
 (d)  $e$       (e)  $e^3$       (f)  $e^{-1/2}$

## 4. Areas:

- (a)  $25/2$       (b)  $4$

5. Volumes: (a)  $13\pi/30$     (b)  $41\pi/105$     6. Volume:  $2\pi(10 - \pi)$ 

## 7. Differential equations:

- (a)  $y = c\sqrt{1-x}/\sqrt{1+x}$       (b)  $y = ce^x/(1+ce^x)$       (c)  $y = \arcsin\left(c + \frac{1}{2} \ln(x^2 + 1)\right)$

## 8. Initial value problems:

- (a)  $y = 2/(2 - x^2)$       (b)  $y = \ln(\frac{2}{3}x^{3/2} + \frac{1}{3})$

## 9. Arclengths:

- (a)  $1261/240$       (b)  $10/3$