Calculus II (Maths 201–NYB)

1. Find the area between:
   (a) $y = x^3 - 2x$ and $y = 3x$;   (b) $x - 3y = 0$ and $x + y = y^3$ above the x axis;

2. Find the volume of the solid obtained when the region between the curves $y = 2x - x^2$ and $y = x^3$ above the x-axis is rotated (a) about the y-axis; (b) about the x-axis.

3. Find the volume of the solid obtained when the region between $y = \sin x$, $y = 0$, $x = 0$, and $x = \pi$ is rotated about the line $x = 5$.

4. Evaluate:
   (a) $\displaystyle\int_0^{\frac{\pi}{2}} \frac{dx}{\sin x}$
   (b) $\displaystyle\int_0^3 \frac{dx}{\sqrt[3]{x-1}}$
   (c) $\displaystyle\int_1^\infty \frac{e^{-\sqrt{x}}}{\sqrt{x}}\, dx$
   (d) $\displaystyle\int_0^4 \frac{x\,dx}{x-2}$
   (e) $\displaystyle\int_2^\infty \frac{dx}{x^2-1}$

5. Evaluate:
   (a) $\displaystyle\lim_{x\to 0} \frac{\arctan x}{\tan 2x}$
   (b) $\displaystyle\lim_{x\to 0^+} x\ln(x^2)$
   (c) $\displaystyle\lim_{x\to 1^+} \left(\frac{1}{\ln x} + \frac{1}{1-x}\right)$
   (d) $\displaystyle\lim_{x\to 0^+} x^{1/(\ln(e^x-1))}$
   (e) $\displaystyle\lim_{x\to 0} (1+\sin 3x)^{(1/x)}$
   (f) $\displaystyle\lim_{x\to 0^+} (\cos x)^{(1/x^2)}$