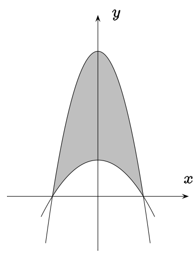
CEGEP JOHN ABBOTT COLLEGE

CALCULUS II (SCIENCE)
(MATHEMATICS 201–NYB/∞)

Winter 1997

1. Perform the following integrals.
   (a) $\displaystyle\int \frac{2\sin^3(\sqrt{x})\cos(\sqrt{x})\ dx}{\sqrt{x}}$
   (b) $\displaystyle\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} x\sin(2x)\ dx$
   (c) $\displaystyle\int \csc^3(2x)\cos^3(2x)\ dx$
   (d) $\displaystyle\int \frac{dx}{(4x^2-9)^{3/2}}$
   (e) $\displaystyle\int \frac{x^2+12x-5}{(x+1)^2(x-7)}\,dx$
   (f) $\displaystyle\int \frac{dx}{x\sqrt{16-9x^2}}$
2. Calculate the following limits.
   (a) $\displaystyle\lim_{x\to\infty}(x-1)e^{-x^2}$
   (b) $\displaystyle\lim_{x\to 0}(1+2\sin x)^{\cot x}$
3. Determine if the following integrals converge or diverge.
   (a) $\displaystyle\int_{-\infty}^{0} \frac{dx}{x^2+9}$
   (b) $\displaystyle\int_{2}^{5} \frac{dx}{(x-2)^{3/2}}$
4. (a) Find the volume of the solid of revolution obtained by rotating the region bounded by the curves $y = 4-4x^2$ and $y = 1-x^2$ about the x-axis. Indicate which method you are using.
   (b) Find the area of the region.



5. Find $\dfrac{dy}{dx}$ and simplify: $y = \operatorname{arcsec} x + \arctan\sqrt{x^2-1}$.
6. Determine whether the following series converge or diverge. State the test used and show that the conditions of the test have been met.
   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{n!}{2^n+1}$
   (b) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{n+1}{2n+1}\right)^n$
   (c) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{\ln n}$
   (d) $\displaystyle\sum_{n=2}^{\infty} \frac{\ln n}{n}$
7. Determine whether the following series are absolutely convergent, conditionally convergent, or divergent.
   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}n}{e^n}$
   (b) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt{2n+1}}$
8. Find the interval of convergence of
$$\sum_{n=0}^{\infty} \frac{(x-1)^n}{2^n(n+1)}.$$
9. Find the *first three non-zero* terms of the Taylor series for $f(x) = \tan x$ about $x = \dfrac{\pi}{4}$.