Math 152 Help Session Interview Questions

1. Find the area bounded by:
   (a) $x = y^2$ and $x - 2y = 3$
   (b) $y = \cos x, y = \sin x, x = 0, x = \pi$
2. Find the volume of the solid obtained by rotating the region R about the specified axis.
   (a) R is the region bounded by $y = x^2$ and $y = 2 - x^2$. R is rotated about the x-axis.
   (b) R is the region bounded by $y = x - x^2$ and $y = 0$. R is rotated about the y-axis.
3. The base of a solid is the region bounded by $y = 4 - x^2$ and the x-axis. Cross sections perpendicular to the y-axis are squares. Find the volume of the solid.
4. Compute the following integrals.
   (a) $\displaystyle\int_1^4 \sqrt{t} \ln t \, dt$
   (b) $\displaystyle\int \cos^3 x \sin^4 x \, dx$
   (c) $\displaystyle\int \frac{\sqrt{x^2 - 4}}{x} \, dx$
   (d) $\displaystyle\int \frac{1}{x^3 + 2x^2 + x} \, dx$
   (e) $\displaystyle\int_3^\infty te^{-t^2} \, dt$
5. (a) Find the length of the curve $x = t^2$, $y = t^3$, $1 \le t \le 2$.
   (b) Find the surface area of the solid obtained by rotating the curve $y = \frac{1}{2}x^2$, $0 \le x \le 4$ about the y-axis.
6. Find the sum of the series:
   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{(-3)^{n-1}}{4^n}$
   (b) $\displaystyle\sum_{n=1}^{\infty} \frac{2}{n(n+2)}$
7. Determine whether the series $\displaystyle\sum_{n=3}^{\infty} \frac{n}{n^2 - 4}$ converges or diverges.
8. Determine whether the series $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^2}$ converges or diverges.
9. Find the radius and interval of convergence for the power series $\displaystyle\sum_{n=1}^{\infty} \frac{(x+3)^n}{2^n\sqrt{n}}$.
10. Find a power series centered at 0 for the function $f(x) = \dfrac{x^2}{3 - x^4}$.
11. Using the known Maclaurin series for $\sin x$, compute $\displaystyle\int x^2 \sin(x^2) \, dx$ as an infinite series.
12. Find the Taylor series for the function $f(x) = \dfrac{1}{x^2}$ centered at $x = 3$.