Spring 2020 Math 152

Week in Review XIII

courtesy: David J. Manuel

(covering FInal Exam Review)

1. Compute each of the following integrals:

    (a) $\displaystyle\int \frac{x-2}{x(x^2+1)}\,dx$

    (b) $\displaystyle\int_{\sqrt{2}}^{2} \frac{1}{\sqrt{x^2-1}}\,dx$

    (c) $\displaystyle\int \cos^3(2x)\,dx$

    (d) $\displaystyle\int x\sin(2x)\,dx$

    (e) $\displaystyle\int_{0}^{\ln(3)} \frac{e^x}{\sqrt{e^x+1}}\,dx$

2. Compute $\displaystyle\int_{0}^{\infty} \left(\frac{2}{2x+1} - \frac{1}{x+3}\right)dx$

3. Find the area of the region bounded by the graphs of $x=0$, $y = \dfrac{3}{2}\tan x$, and $y = \cos x$.

4. The region bounded by $y = 4 - x^2$ and $y = 3$ is revolved around the line $x = 2$. Write an integral to find the volume.

5. Find the volume of the solid whose base is the triangular region with vertices $(0, 0)$, $(3, 0)$, and $(0, 4)$ and whose cross-sections perpendicular to the x-axis are semicircles.

6. Consider a trough in the shape of a half-cylinder of radius 3 feet and length 8 feet (diameter at the top). It is full of water to a depth of 3 feet. Find an integral that gives the work necessary to pump all of the water to a point 1 foot above the top of the trough.

7. Write a power series for the function $f(x) = \ln(1+2x)$ centered at $x = 0$.

8. Write a power series for the function $f(x) = e^{-x}$ centered at $x = 1$.

9. Determine whether the following series converge or diverge. Name and apply an appropriate test and state all the conditions that must be satisfied.

    (a) $\displaystyle\sum_{n=0}^{\infty} \frac{n^2}{\sqrt{n^5+10}}$

    (b) $\displaystyle\sum_{n=2}^{\infty} \frac{\ln(n)}{n}$

10. Find the radius and interval of convergence of $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{\sqrt{n+7}}$.

11. Find the second degree Taylor polynomial for $f(x) = \sqrt{x}$ at $x = 1$.

12. The curve parametrized by $x = 3t - t^3$, $y = 3t^2$, $t \in [0, 1]$ is rotated about the x-axis. Find the area of the surface formed.

13. Sketch the graph of the polar equation $r = 8 + 8\sin(\theta)$.