Math 200 Review 4

Test 4: November 15, 2018

The assigned homework exercises after Test 3 form the coverage for Test 3. The following items are additional practice problems.

1. Evaluate the integral.
   \[
   \text{(a) } \int_0^{\pi/3} \frac{\sin(3x)}{\sqrt{1 + \cos(3x)}} \, dx \\
   \text{answer: } \frac{2\sqrt{2}}{3}
   \]
   \[
   \text{(b) } \int_{1/6}^{1/3} \cot(\pi x) \, dx \\
   \text{answer: } \frac{\ln(3)}{2\pi}
   \]
   \[
   \text{(c) } \int_{\pi/8}^{\pi/6} \sec^2(2x)e^{\tan(2x)} \, dx \\
   \text{answer: } \frac{1}{2}(e^{\sqrt{3}} - e)
   \]
   \[
   \text{(d) } \int \frac{dx}{3x^2 - 6x + 15} \\
   \text{answer: } \frac{1}{6} \arctan\left(\frac{x-1}{2}\right) + C
   \]
   \[
   \text{(e) } \int_2^3 \frac{dx}{\sqrt{4x-x^2}} \\
   \text{answer: } \frac{\pi}{6}
   \]

2. Evaluate the derivative of the function.
   \[
   \text{(a) } f(x) = \ln(|\sec(x) + \tan(x)|) \\
   \text{answer: } \sec(x)
   \]
   \[
   \text{(b) } f(x) = \ln\left(\frac{x^2-1}{x^2+1}\right) \\
   \text{answer: } \frac{2x}{x^2-1}
   \]
   \[
   \text{(c) } f(x) = \frac{x^2-2}{x^2+1} \\
   \text{answer: } \frac{6x^2}{(x^2+1)^2}
   \]

3. Sketch and shade the region bounded by the graphs of \(y = x^2\) and \(y = 8\sqrt{x}\).
   A solid is generated when the region is revolved about the \(x\)-axis. Evaluate the volume of the solid.
   \[
   \text{answer: } \frac{1536\pi}{5}
   \]

4. The base of a solid is bounded by the graphs of \(y = x + 1\), \(y = 2x + 3\), \(x = 0\), and \(x = 2\).
   The cross sections of the solid perpendicular to the \(x\)-axis are squares. Find the volume of the solid.
   \[
   \text{answer: } \frac{56}{3}
   \]