Fourth Examination
Tuesday, April 25, 2017

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. Each part of each problem is worth 9 points, and 1 point is free.

1. Write down the following sums in closed form.

   (a) $\displaystyle\sum_{k=1}^{5}(2k+1)$.

   (b) $\displaystyle\sum_{k=1}^{5} f(x_k)\Delta x$, where $f(x) = 2x + 1$, $\Delta x = 1$, and $x_k = k$.

   (c) $\displaystyle\sum_{k=1}^{30}\left(\frac{1}{k} - \frac{1}{k+1}\right)$.

2. Compute the following indefinite integrals.

   (a) $\displaystyle\int u^2 + 1\, du$ (b) $\displaystyle\int \frac{1}{x^2+1}\, dx$ (c) $\displaystyle\int \left\{[\sin(x)]^2 + 1\right\}\cos(x)\, dx$

3. Compute the following definite integrals.

   (a) $\displaystyle\int_0^{\pi/2} \left\{[\sin(x)]^2 + 1\right\}\cos(x)\, dx$ (b) $\displaystyle\int_0^{\sqrt{\ln(2)}} 2te^{t^2}\, dt$ (c) $\displaystyle\int_{-1}^{1} x^2\, dx$

   (d) $\displaystyle\int_0^1 x^2\, dx$

4. Compute the area underneath the graph of $y = x^2$ and above the interval $x \in [0, 1]$.