This is a review of the material covered in Chapter 4 (so far) leading up the Unit IV "Big Quiz", which will be counted as your fourth exam for the course. This review has 7 questions. This review will not be graded. It is simply for you to review the material covered in class and in the textbook in preperation for the Unit IV "Big Quiz".

1. Using the summation formulas, determine the value of the following summations.

   (a) $\displaystyle\sum_{k=1}^{6} (2k+1)$

   (b) $\displaystyle\sum_{k=1}^{75} \left(2k^2\right)$

   (c) $\displaystyle\sum_{i=1}^{10} \left(3i^2 - 7i - 1\right)$

2. The following summations each represent the **right** Riemann sum of a given function for a finite number of rectangles. Identify the following pieces make up the Riemann sum: $f(x)$, the interval $[a, b]$, $n$, $\Delta x$.

(a) $\displaystyle\sum_{k=1}^{8}\left(e^{2+k\cdot\frac{1}{4}}\cdot\frac{1}{4}\right)$

- $f(x) =$ __________
- $[a, b] =$ __________
- $n =$ __________
- $\Delta x =$__________

(b) $\displaystyle\sum_{k=1}^{100}\left(\tan\left(k\cdot\frac{\pi}{600}\right)\cdot\frac{\pi}{600}\right)$

- $f(x) =$ __________
- $[a, b] =$ __________
- $n =$ __________
- $\Delta x =$__________

(c) $\displaystyle\sum_{k=1}^{4000}\left(\ln\left(3+k\cdot\frac{e^2-3}{4000}\right)\cdot\frac{e^2-3}{4000}\right)$

- $f(x) =$ __________
- $[a, b] =$ __________
- $n =$ __________
- $\Delta x =$__________

(d) $\displaystyle\sum_{k=1}^{16}\left(\left|-3+k\cdot\frac{5}{8}\right|\cdot\frac{5}{8}\right)$

- $f(x) =$ __________
- $[a, b] =$ __________
- $n =$ __________
- $\Delta x =$__________

3. Use geometry (i.e., areas of triangles, rectangles, and circles) to find the exact values of each of the definite integrals.

(a) $\displaystyle\int_{-2}^{4}\left(|3x+1|\right)\,dx$

(b) $\displaystyle\int_{2}^{8}\left(2+\sqrt{9-(x-5)^2}\right)\,dx$

4. Below is the graph of the function $h(x)$.

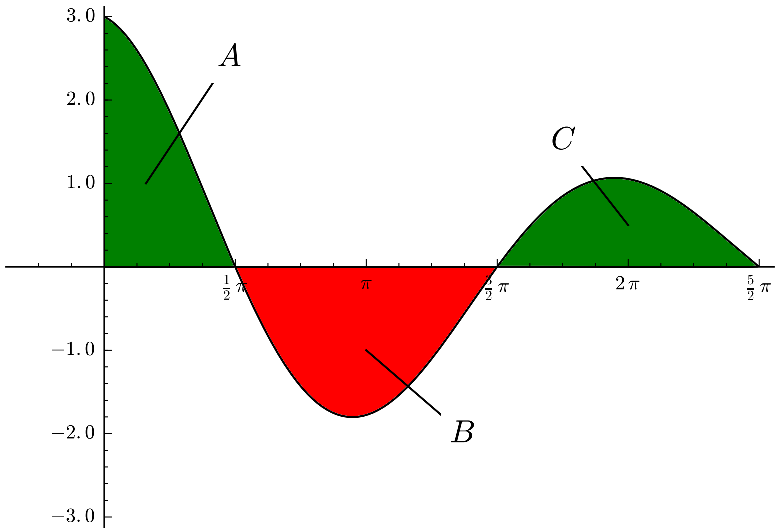


Figure 1: `https://goo.gl/ZbHfLR`

If the approximate absolute area of regions $A$, $B$, and $C$ are 2.733, 3.577, and 2.119 respectively, determine the value of the following definite integrals. Round your answers to three decimal places.

(a) $\displaystyle\int_0^{\frac{\pi}{2}} h(x)\,dx=$______ (d) $\displaystyle\int_0^{\frac{5\pi}{2}} h(x)\,dx=$______ (g) $\displaystyle\int_0^{\frac{\pi}{2}} [h(x)+2]\,dx=$______

(b) $\displaystyle\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} h(x)\,dx=$______ (e) $\displaystyle\int_0^{\frac{3\pi}{2}} 2h(x)\,dx=$______ (h) $\displaystyle\int_{\frac{3\pi}{2}}^{\frac{5\pi}{2}} [1-h(x)]\,dx=$______

(c) $\displaystyle\int_{\frac{3\pi}{2}}^{\frac{5\pi}{2}} h(x)\,dx=$______ (f) $\displaystyle\int_{\frac{3\pi}{2}}^{\frac{5\pi}{2}} |h(x)|\,dx=$______ (i) $\displaystyle\int_{\frac{5\pi}{2}}^{0} 2|h(x)|\,dx=$______

5. The **floor** function is defined to the *the greatest integer less than or equal to* $x$ and is denoted by the symbol $\lfloor x \rfloor$. Using geometry, find the value of the following definite integral:

$$\int_1^5 x\lfloor x \rfloor\,dx.$$

The following Desmos graph may be useful: `https://www.desmos.com/calculator/l5cw5x57uc`.

6. Use integration formulas to solve each of the following integrals. You may have to use algebra, educated guess-and-check, and/or recognize an integrand as the result of a product, quotient, or chain fulr calculation. You can check each of your answers by differentiating.

   (a) $\displaystyle\int \left(x^3 + 4\right)^2\, dx$

   (b) $\displaystyle\int \frac{3}{1+x^2}\, dx$

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

   (d) $\displaystyle\int 3x^2\cos(x^3+1)\, dx$

(e) $\displaystyle\int \left(2x\sin(x) + x^2\cos(x)\right)\, dx$

(f) $\displaystyle\int \left(\frac{-\sin(x)\ln(x) - \frac{\cos(x)}{x}}{(\ln(x))^2}\right)\, dx$

(g) $\displaystyle\int \left((2x+3)e^{x^2+3x+2} + \cos(x)\right)\, dx$

(h) $\displaystyle\int |\sin(x)|\cot(x)\, dx$ $\left[\text{Hint: Change } \cot(x) = \frac{\cos(x)}{\sin(x)}\right]$

7. Use the Fundamental Theorem of Calculus to find the exact values of each of the definite intergrals below. You are encouraged to use Desmos to check your answer, but only exact answers should be given.

   (a) $\int_0^1 \left(\frac{1}{2e^x}\right)\, dx$

   (b) $\int_5^{11} \left(\frac{1}{x-3}\right)\, dx$

   (c) $\int_{-\frac{\pi}{6}}^{\frac{\pi}{3}} \left(\sec^2(x)\right)\, dx$

   (d) $\int_{-1}^{1} \left(\frac{e^x - xe^x}{e^{2x}}\right)\, dx$