Math-13 Sections 01, 02

Final Exam #2

Due: 12/3/2020 at 10:00pm

This exam is open book and notes. You may use a calculator. No collaboration or other web access is allowed. All answers must be in exact form unless stated otherwise (i.e., no decimal answers allowed). You *must* show all work and that work must be logical and complete; there is *no* credit for guessed answers or answers without supporting work.

You must work the exam problems, in order, on separate sheets of paper; camscan your results into a single PDF file; and then submit your PDF file back to Moodle (just like the written homeworks and midterm exams). This *must* be done by the deadline; late exams, multiple file or non-PDF submissions, and exams sent by email will not be accepted.

Good luck!

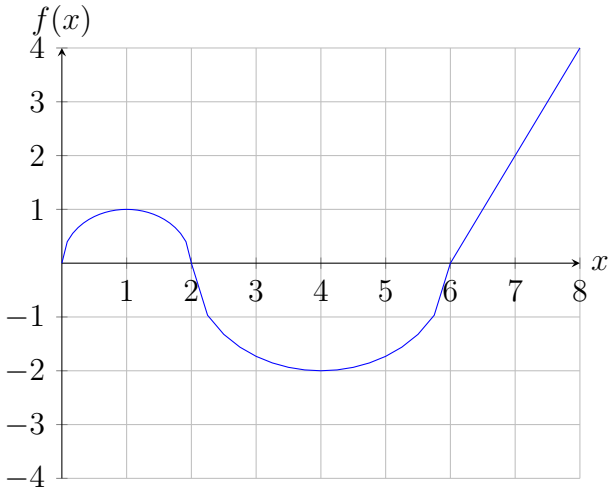
1. Evaluate the following:

   (a) $\int (3x^2 - 5x + 2)dx$

   (b) $\int_1^2 (3x^2 - 5x + 2)dx$

2. A certain vaccine is created by mixing a certain retrovirus with a certain protein in a large vat. When the reactants are first mixed together, the amount of vaccine produced is accelerating at a rate of 2 grams/hour^2. Assuming that the initial rate of production is 0 grams/hour and the vat is initially seeded with 10 grams of pre-made vaccine, how much vaccine does the vat contain after 24 hours?

3. Consider the following function (assume that the curved parts are semicircles):



Calculate $\int_0^8 f(x)dx$. Your answer must be in exact form (no decimals).

4. Let $\int_0^2 f(x)dx = 3$ and $\int_0^2 g(x)dx = -2$. Calculate:

$$\int_0^2 [5f(x) - 2g(x) + 1]dx$$

5. Estimate $\int_1^7 x^3 dx$:
   (a) Using a left-hand Riemann sum with $n = 6$.
   (b) Using a right-hand Riemann sum with $n = 6$.

6. Calculate the exact value for $\int_1^7 x^3 dx$.

7. Calculate the following sums. Your score will be based on how efficiently you perform the calculations. Note that there is NO credit for manually adding all of the terms (which would take a long time anyway).

   (a) $\sum_{k=1}^{100}(2k+1)$

   (b) $\sum_{k=1}^{100}[k^3-(k+1)^3]$

8. Let $f(x)=\int_{x^2}^{\pi}(x^2\sqrt{x+1}+5)dx$. Determine $f'(x)$.

9. Let $f(x)=3x(x^2+1)^3$. What is the average value of $f(x)$ on $[0,2]$?

10. Evaluate: $\int_4^{12} x\sqrt{2x+1}dx$.