Exam 2

TMath 125

Autumn 2019

NAME:

1. [7] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F.

   T F $(x^2)^3 = x^5$

   T F $\sqrt{b^2 + x^2} = b + x$

   T F $\int x^2 \cdot e^x \, dx = \frac{1}{3}x^3 \cdot e^x + c$

   T F $\frac{d}{dx}(\cos(x)) = \sin(x)$

   T F $\sec(x) = \frac{1}{\cos(x)}$

   T F $\int \ln(x) \, dx = \frac{1}{x} + c$

   T F $\int 7^x \, dx = \frac{1}{\ln(7)} 7^x + c$

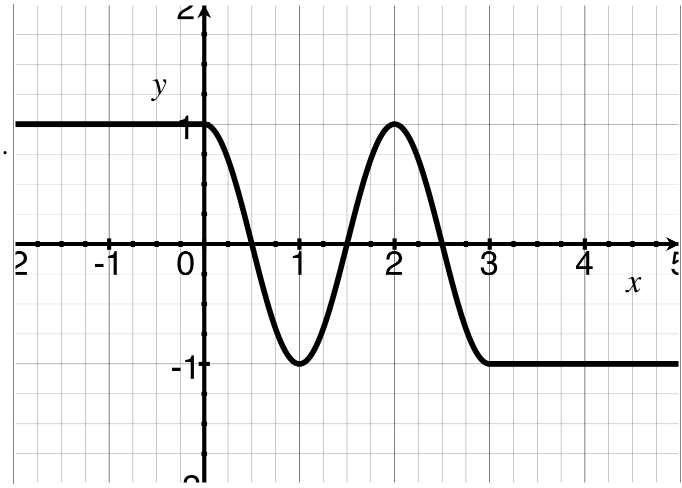
   Show all your work. Reasonable supporting work must be shown to earn credit.

2. Let $f(x)$ be a function.

   (a) [2] Explain what $\displaystyle\int_0^5 f(x) \, dx$ is.

   (b) [2] Explain the mathematical difference between $\displaystyle\int f(x) \, dx$ and $\displaystyle\int_0^5 f(x) \, dx$.

3. (§8.3 #68) The graph of $f'(x)$ is given below. Use the graph of $f'(x)$ to answer:



(a) [2] Approximate the slope of the line tangent to f at $x = 4$. Explain how you know.

(b) [3] Find the approximate x where f reaches a maximum. Explain how you know.

4. [5] One problem required a substitution of $x = 5\sin(\theta)$. Find the following quantities in terms of x:

(a) $\sin(\theta)$

(b) $\cos(\theta)$

(c) $\tan\theta$

5. [10] (§8.2 #64, WebHW9, TrigActivity#1) Find the indefinite integrals for TWO of the following:

   (a) $\displaystyle\int \cos^2(\theta)\sin^3(\theta)\,d\theta$

   (b) $\displaystyle\int \sqrt{1-4x^2}\,dx$

   (c) $\displaystyle\int t\sqrt{4-t}\,dt$

6. [3] (Quiz3 #2) Set up the definite integral(s) to compute the area trapped between $y = 2xe^{-x}$, $y = 2$, $x = 0$ and $x = 3$. Do not compute the answer.

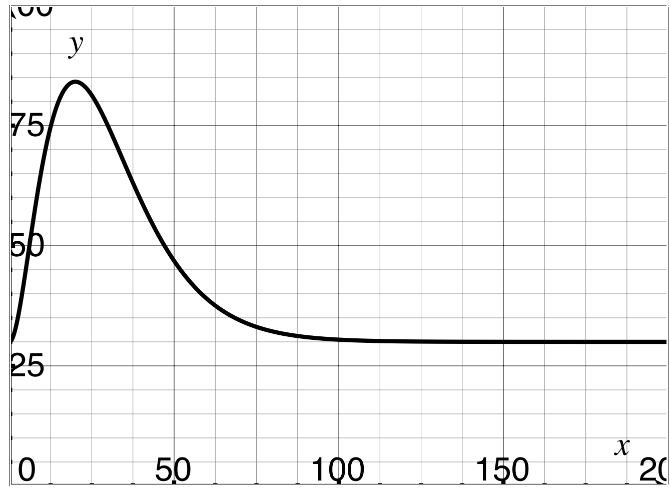
7. (Lecture) Consider a solid whose base is bounded by $y = 1 - \frac{x}{2}$, $y = -1 + \frac{x}{2}$ and $x = 0$. The cross sections perpendicular to the x-axis are equilateral triangles. Complete the following steps as you would to find the volume of the object.

   (a) [2] Draw the base of the object with the x and y axis.

   (b) [2] Recall the volume can be calculated by taking limits of a sum of approximating slices/sections/cylinders/shapes. Draw such an approximating slice/section/cylinder/shape that you can use to find the volume of the object. Be sure to include the x, y, and z axis.

   (c) [3] Set up the definite integral that would find the volume of the object. Do *not* compute this.

8. (Word Problem2 #4) The download rate from the internet company is variable starting low, increasing, and then decreasing again. This data download rate (megabytes/second) can be modeled by $t^2 e^{\frac{-t}{10}} + 30$ where t is seconds since the start of download. The graph is given on the right.



   (a) [1] Approximate the maximum download rate.

   (b) [2] Approximate how much data has been downloaded in the first 50 seconds. Specify how you are doing your approximation!

   (c) [1] is the approximation above an over or under estimate?

   (d) [3] We would like to know how long it take to download a movies that is 3.5 gigabytes. Set up the equation (involving an integral) to find this time. Do not solve the equation.

9. [2] Explain one mathematical concept that your studied well while preparing for this test but don't feel as if you got to fully demonstrate. (Note, I am not asking for an analysis of what the test is lacking but rather a stunning display of mathematical prowess on your part.)