MAT 1120 - Review for Exam 2

Here are some questions in order to help you review. These should be very familiar—these were mostly collated and adapted from group practice sheets, whose solutions are online, in-class activities and paper hw, where we discussed solutions during class or lab, and Wiley practice, so that is where you should look to for solutions. The whole point of this exam review is that I collated these for you in a form where it isn't attached to the answers unless you go back to the originals.

1. Look at the region R between $y = \sin x$ and $y = 2\sin x$ from 0 to π
   (a) Roughly sketch R and a slice for the area of R
   (b) Set up the integral that gives the area
   (c) Identify geometric/physical components
   (d) What is the main integration method we would use to integrate?
   (e) To the right of your sketch above, sketch a slice for the volume formed by revolving the same region R about the x-axis.
   (f) Set up the integral that gives the volume
   (g) Identify geometric/physical components
2. What is the work to pump water of 62.4 lb/ft^3 from a cylindrical tank on its side of radius 3, length 15, and buried 4 feet underground as follows in (a)–(f):
   (a) Sketch a diagram and a slice and label components
   (b) To the right of this sketch, sketch a diagram that shows why we need Pythagorean theorem or similar triangles and label components in terms of a given variable, say y or h
   (c) What is the work for a slice
   (d) Set up an integral to find the total work
   (e) Identify the geometric and physical meaning of the components in the integral.
   (f) What is the main integration method we would use to integrate?
3. Answer questions similar to #2 for various geometric problems, such as:
   (a) How would (a)–(f) in #2 change if you had a similar problem, but for a sphere?
   (b) How about for a cone?
   (c) How about for a pyramid?
   (d) How about for an upside down pyramid, like a lake?
   (e) How about a cylinder standing upright, like a garbage tank? Would you even need Pythagorean theorem or similar triangles?
   (f) How about for a surface of revolution given by revolving $\frac{1}{x}$ about the $x-$axis?
4. What is the work to compress a spring, using Hooke's law $F = kx$, where $k = 4$ and we want to compress from 3 to 2. Set up the work and identify geometry and physical components.
5. What is the total mass for a rod of length 10cm, which has density $\dfrac{32}{x+3}$ gm/cm at a distance of x cm from the left.
   (a) Set up the integral that gives the mass
   (b) Identify geometric/physical components

(c) What is the main integration method we would use to integrate?

6. What if you have similar geometry as #2–3 but the density is gm/cm^3, or a region with density gm/cm^2 and want to find the total mass rather than the work? Or what if you wanted cars when traffic density is cars/mile?

7. What is the arc length of the curve $\tan(3x^2)$ from 0 to 1? Set up but do not evaluate.

8. 7 tons of pollutants are dumped once a day. If 25% are removed by natural process before the next dumping, then what is the quantity after 3 months? Set up as a series and then find the response using a series method. Show work.

9. Write out the partial sums S_1 and S_2 for the series $\sum_{n=1}^{\infty} \frac{1}{n}$. Do not simplify.

For sequences EXPLAIN or SHOW WORK documenting why your answer is correct:

(a) write "sequence." does it converge or diverge, and why

(b) what is the limit if it converges?

(c) show work for L'Hôpital's Rule if it applies.

For series EXPLAIN or SHOW WORK documenting why your answer is correct:

(a) (LG 3) choose a series test we can successfully use on it from among geometric series, terms not going to 0, linearity, or integral test and write the name of the test

(b) fully document why the series test works, including any assumptions

(c) specify whether the series converges or diverges, and why

10. $s_n = e^n$
11. $s_n = e^{-n}$
12. $s_n = ne^{-n}$
13. $\sum_{n=0}^{\infty} e^n$
14. $\sum_{n=1}^{\infty} e^{-n}$
15. $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$
16. $\sum_{n=1}^{\infty} \frac{1}{n^2}$
17. $\sum_{n=0}^{\infty} (\frac{1}{2})^n + (\frac{1}{e})^n$
18. $\sum_{n=2}^{\infty} \frac{1}{n \ln n} + (\frac{1}{2})^n$

Other types of questions:

19. First circle the kind(s) of series this is. Circle all that apply:
geometric terms $\not\to 0$ alternating none of these
Next explain what is wrong with the following statement.
20. Explain the mathematics in this visual or convert the following comic to series notation like we did in class and stop there.
21. One of the four main educational goals at Appalachian is local to global perspectives, and it is also a theme in Calculus II. Name an instance in our class where local perspectives where important in understanding the global perspective, and specify what is local and what is global in your example.