Kaleb Burris
STAT F300 Statistics, Dr. Short
Homework 1, Due Friday, January 20, 23:59

1. Name (print): Kaleb Burris

Signature: *Kaleb Burris*

Student ID: 31196184

What is your primary field or area of study?
Computer Science.

What interests you?
New ideas; things that make other things better.

2. Do you have any special needs or concerns regarding this class that I should know about? If so, please describe briefly.

No.

3. When was the most recent calculus course you've taken (semester/year)? Have you had Calc II? Calc III? (These aren't required for the course; I'm just trying to get an idea of how much Calc I refresher I'll need to include.)

I took Calculus I last semester and I'm taking Calculus II this semester.

Please describe your computing experience, e.g. software packages you've worked with, languages you've written in, etc. Please include an estimate of how much time you've spent at each, for example, 1 hour, 10 hours, 100 hours, 1000 hours, etc.

I've used a lot of different packages and done a lot of programming, probably totaling over 2000+ hours. I've spent a decent amount of that time on recreational math problems and projects. My coding experience spans Java, C, C++, Python, Javascript, Rust, MathLab, and a little R. I'm currently writing this using LaTeX, *which I picked up over this last winter break.*

Do you have a laptop you can bring to class for working problems that require more than a calculator?

Yes.

Do you have a desktop or laptop computer you can use for (some) homework problems?

Yes.

4. Evaluate the following. Be sure to sure your work. In particular, if you apply a formula, you need to state the formula, then plug numbers into the formula, then state the final result.

$\Rightarrow$ indicates the beginning of work.

You can use `\sum\limits_{min}_^{max}` to get limits for functions on inline text: $\sum\limits_{i=1}^{15}$

(a)

$$\int 4x^3 \mathrm{d}x$$
$$\Rightarrow \frac{4x^4}{4} + C = \boxed{x^4 + C}$$

(b)

$$\int_1^2 4x^3 \mathrm{d}x$$
$$\Rightarrow x^4\Big|_1^2 = 2^4 - 1^4$$
$$= 16 - 1 = \boxed{15}$$

(c)

$$\int \exp(-2x)\mathrm{d}x = \int e^{-2x}\mathrm{d}x$$
$$\Rightarrow \boxed{-\frac{1}{2}e^{-2x} + C} \quad or \quad \boxed{-\frac{1}{2}\exp(-2x) + C}$$

(d)

$$\int_0^{2\pi} (1 + \sin(x))\mathrm{d}x$$
$$\Rightarrow (x - \cos(x))\Big|_0^{2\pi}$$
$$= (2\pi - \cos(2\pi)) - (0 - \cos(0))$$
$$= (2\pi - 1) - (-1) = \boxed{2\pi}$$

(e)

$$\sum_{i=1}^{50}(0.3i + 1)$$
$$\text{Using} \quad \sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$
$$\Rightarrow \sum_{i=1}^{50}(0.3i+1) = \sum_{i=1}^{50} 1 + 0.3\sum_{i=1}^{50} i$$
$$= 50 + 0.3\left(\frac{50(50+1)}{2}\right) = 50 + 382.5$$
$$= \boxed{432.5}$$

(f)

$$\sum_{i=7}^{50}(0.3i + 1)$$
$$\text{Using} \quad \sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$
$$\Rightarrow \sum_{i=1}^{50}(0.3i+1) - \sum_{i=1}^{6}(0.3i+1) = \sum_{i=7}^{50}(0.3i+1)$$
$$= 432.5 - \left(\sum_{i=1}^{6}(0.3i+1) = 432.5 - \sum_{i=1}^{6} 1 + 0.3\sum_{i=1}^{6} i\right)$$
$$= 432.5 - \left(6 + 0.3\left(\frac{6(6+1)}{2}\right)\right) = 432.5 - 12.3$$
$$= \boxed{420.2}$$

(g)

$$\sum_{i=1}^{15}(-0.2i^2 + 1)$$
$$\text{Using} \quad \sum_{i=1}^{n} i^2 = \frac{1}{6}n(n+1)(2n+1)$$
$$\Rightarrow \sum_{i=1}^{15} 1 - 0.2\sum_{i}^{15} i^2 = 15 - \frac{1}{6}15(15+1)(2(15)+1)$$
$$= 15 - 248 = \boxed{-233}$$

(h)

$$\sum_{i=6}^{15}(0.5)^i$$
$$\text{Using} \quad \sum_{i=0}^{n-1} ar^i = \frac{a - ar^n}{1-r}, r \neq 1$$
$$\Rightarrow \sum_{i=6}^{15}(0.5)^i = \sum_{i=0}^{15}(0.5)^i - \sum_{i=0}^{5}(0.5)^i$$
$n+1$ used because of $n-1$ in formula.
$$= \frac{1 - 1(0.5)^{16}}{1 - 0.5} - \frac{1 - 1(0.5)^6}{1 - 0.5}$$
$$\approx \boxed{0.061}$$

(i)

$$\sum_{i=3}^{\infty}(0.8)^i$$

$$\text{Using} \sum_{i=0}^{\infty} ar^i = \frac{a}{1-r}, -1 < r < 1$$

$$\text{and} \sum_{i=0}^{n} ar^i = \frac{a-ar^n}{1-r}, r \neq 1$$

$$\Rightarrow \sum_{i=3}^{\infty}(0.8)^i = \sum_{i=0}^{\infty}(0.8)^i - \sum_{i=0}^{2}(0.8)^i$$

$$= \frac{1}{1-0.8} - \frac{1-1(0.8)^2}{1-0.8} = 5 - 3.2 = \boxed{1.8}$$