

Math 220 AD9 Spring 2009 Worksheet 30

1. What is the following sum?

$$\sum_{i=37}^{73} \frac{3i^2}{5} - 2i$$

2. (Continued from last time) Roadrunner escapes unharmed – Wile E. Coyote’s calculations were off and the anvil hit the desert floor before Roadrunner was near the cliff-face. Why?

Wile E. Coyote decides to be more accurate with his calculations. He knows that at t seconds, the speed of the anvil is $10 + 4.9t$ m/s. He wants to know how far the anvil falls in 5 seconds. He splits that 5 seconds into n equal pieces – into periods of time of length $\frac{5}{n}$. He uses the speed at the *end* of the i^{th} time period to estimate how far it falls in that time period. What is this estimate?

What is his estimate for the distance it falls in 5 seconds? Express this using sigma-notation.

How far does the anvil actually fall in 5 seconds?

3. Sketch the graph of the following function $y = x^2 + 5$ on the interval $[0, 3]$.

We can examine this as follows.

- Split the interval into 5 equal subintervals – what are the endpoints of these intervals?
- Draw 5 rectangles whose bases are given by these 5 subintervals and whose tops just barely touch the graph of the curve.
- What is the area of the i^{th} rectangle?
- Use sigma-notation to write down the sum of the areas of these rectangles.
- Evaluate this sum.
- Repeat the above with 20 instead of 5.
- Repeat the above with n instead of 5.
- Take the limit as n tends to infinity – what does this give you? Why?

4. Last time, you found

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{1}{n} \left(3 \left(\frac{i}{n} \right)^2 + 4 \left(\frac{i}{n} \right) \right) = 3$$

What is one “meaning” of your final answer?

5. Find the area under the curve $y = x^2 + 4x + 5$ and above the x -axis on the interval $[2, 5]$.

6. Suppose that you know $f''(x) = 3x^2$, $f'(1) = 5$ and $f(2) = 0$. What is the function $f(x)$?

7. Find the following indefinite integrals

$$\int (x^2 + 3)\sqrt{x} \, dx, \quad \int \frac{x+1}{\sqrt[5]{x}} \, dx, \quad \int \frac{2}{x} + 3 \sec x \tan x \, dx.$$

8. Differentiate the following functions

$$\ln(2x^2 + 5), \quad \sin(3x + 1).$$

Integrate the following functions

$$\frac{10x}{x^2 + 9}, \quad \cos(4x + 2).$$

9. Evaluate two of the following three integrals:

$$\int \frac{3x^2 + 2}{x^2} \, dx, \quad \int \frac{x^2}{3x^2 + 2} \, dx, \quad \int \frac{e^x}{2e^x + 5} \, dx.$$

What is the “moral” of this question?

Preparation for next time

For Monday, read sections 4.3 and 4.4. There will be a preparation quiz for your Math 199 grade.