Analysis 2

28 February 2024

Instructor: Adam Abrams

Analysis 1 vs. Analysis 2

What are the An. 2 topics?

- "directional derivatives"

- "iterated integrals"

- "differential equations"

- and more!

If you do not remember An. 1 derivatives and integrals, these will be impossible!

If you do know An 1., the calculations are similar. The new ideas can be difficult.

How is the grade determined?

- Quizzes, exams, participation. I will give the details next week.

Algebra Review

Do as many of these as you can:

1. Simplify $\dfrac{\left(\sqrt{x}\right)^4}{x}$ if $x \neq 0$.

2. Simplify $\sqrt{x^6}$.

3. Solve $\dfrac{x+y}{x-y} = 100$ for y.

4. Solve $\ln(y) = 4x + \ln(15)$ for y. Simply your answer.

5. Solve the system of equations
$$\begin{cases} a + 2b = 3 \\ 5a - 4b = -20. \end{cases}$$

6. Solve the system of equations
$$\begin{cases} x^2 + y = 5 \\ x + y = 3. \end{cases}$$

7. Solve the equation $x^2 - 6x + 13 = 0$.

Algebra Review - Answers

1. x

2. x^3

3. $y = \dfrac{99}{100}x$

4. $y = 15e^{4x}$

5. $a = -2, b = \dfrac{5}{2}$

6. Two solutions:
$(x, y) = (-1, 4)$,
$(x, y) = (2, 1)$

7. $x = 3 \pm 2i$

Analysis Review

Calculate as many of these as you can:

1. $\left(x^{10}\right)'$

2. $\left(x^3 \sin(x)\right)'$

3. $\left(x^3 \cdot x^7\right)'$

4. $\dfrac{d}{dx}(x^2 + 10)^3$

5. $\displaystyle\int x^8 dx$

6. $\displaystyle\int_a^2 x^8 dx$

7. $\displaystyle\int \frac{x^2 + 1}{x} dx$

8. $\displaystyle\int \frac{x}{x^2 + 1} dx$

9. $\displaystyle\int_5^b x\sqrt{x^2 - 16}\, dx$

Analysis Review - Answers

1. $10x^9$

2. $3x^2 \sin(x) + x^3 \cos(x)$

   Product Rule:
   $(fg)' = f'\, g + f\, g'$

3. $10x^9$

   Note: the incorrect idea that $(fg)' = f'g'$ would make $(x^3 \cdot x^7)'$ different from $(x^{10})'$, which is impossible.

4. $3(x^2 + 10)^2 \cdot 2x$

   from Chain Rule

5. $\dfrac{1}{9}x^9 + C$

6. $\dfrac{512 - a^9}{9}$

7. $\dfrac{1}{2}x^2 + \ln(x) + C$

8. $\dfrac{1}{2}\ln(x^2 + 1) + C$

9. $\dfrac{1}{3}\left(b^2 - 16\right)^{3/2} - 9$

Websites

We will use **theadamabrams.com/1510** for

- course policies,

- course "textbook" and other resources,

- lecture slides,

- task lists.

We will also use **eportal.pwr.edu.pl**.