

MATH 22 PRACTICE EXAM ON INTEGRATION OF RATIONAL FUNCTIONS

Name:

Section:

Instructions:

- (1) Books, notes, and calculators are not permitted.
- (2) Simplify as instructed. On some problems, unsimplified correct answers will not receive full credit.
- (3) Show your work as instructed. On some problems, correct answers without justification will not receive full credit.

(1)

(2)

(3)

(4)

(5)

Total

Problem 1. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following indefinite integrals is easy to evaluate without using the method of partial fractions?

A. $\int \frac{1}{x^4 - 5x^2 + 4} dx.$

B. $\int \frac{x^2 - 1}{x^4 - 5x^2 + 4} dx.$

C. $\int \frac{4 - 5x^2}{x^4 - 5x^2 + 4} dx.$

D. $\int \frac{2x^3 - 5x}{x^4 - 5x^2 + 4} dx.$

E. None of these.

Problem 2. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Define the rational function

$$f(x) = \frac{1}{(x+3)^2(x-2)}.$$

Which of the following sums has the form of the correct partial fraction decomposition of $f(x)$?

A. $\frac{A}{x+3} + \frac{B}{x-2}.$

B. $\frac{Ax}{x+3} + \frac{B}{x-2}.$

C. $\frac{A}{(x+3)^2} + \frac{B}{x+3} + \frac{C}{x-2}.$

D. $\frac{Ax}{(x+3)^2} + \frac{B}{x+3} + \frac{C}{x-2}.$

E. None of these.

Problem 3. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Define the rational function

$$f(x) = \frac{x^2}{(x^2 + 36)(x + 6)}.$$

Which of the following sums has the form of the correct partial fraction decomposition of $f(x)$?

A. $\frac{A}{x^2 + 36} + \frac{B}{x + 6}.$

B. $\frac{Ax}{x^2 + 36} + \frac{B}{x + 6}.$

C. $\frac{Ax + B}{x^2 + 36} + \frac{B}{x + 6}.$

D. $\frac{Ax}{x^2 + 36} + \frac{B}{x + 6} + \frac{C}{x - 6}.$

E. None of these.

Problem 4. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Define the rational function

$$f(x) = \frac{x^3}{(1 + x + x^2)^2(1 + x)^2(1 - x)}.$$

In the partial fraction decomposition of $f(x)$, how many constants A , B , C , etc. are there?

A. 3.

B. 4.

C. 5.

D. 6.

E. None of these.

Problem 5. (15 pts.) Evaluate the indefinite integral

$$\int \frac{4}{x^3 + 4x} dx.$$

Show your work.

Problem 6. (15 pts.) Evaluate the indefinite integral

$$\int \frac{x}{x^4 + x^2 + 1} dx.$$

Show your work.

Problem 7. (15 pts.) Evaluate the definite integral

$$\int_0^5 \frac{3x - 1}{x + 2} dx.$$

Show your work and simplify your answer.