

You may keep this page of questions. Turn in your answers with all of your work on the colored paper.

**NO CALCULATORS ARE ALLOWED FOR THIS EXAM.**

- (1) 10 Points. Write down the abstract partial fractions decomposition for

$$f(x) = \frac{5x^7 - x^6 + 8x^3 - 19\pi}{(x-2)(x+7)^3(x^2+17)(x^2-6x+61)^2}.$$

Evaluate the following antiderivatives.

(2) 12 Points.  $\int x^5 \ln x \, dx.$

(3) 12 Points.  $\int \sin^3 \theta \cos^3 \theta \, d\theta.$

(4) 18 Points.  $\int \frac{x^2 - 18x + 25}{(x+2)(x^2+9)} \, dx.$

(5) 16 Points.  $\int x^3 \cos(kx) \, dx.$  Assume that  $k \neq 0.$

- (6) 18 Points. Find the exact area of the region in the  $xy$ -plane that is bounded by  $y = \frac{1}{(x^2+4)^{\frac{3}{2}}}$ ,  $y = 0$ ,  $x = 0$  and  $x = \sqrt{5}.$

- (7) 14 Points. Using the table for  $f(x)$  below, find the numerical approximations  $R_4, L_4, T_4, M_4$  and  $S_4$  for the integral  $\int_3^5 f(x) \, dx.$

$x$	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00
$f(x)$	5	6	8	10	12	9	7	4	3