Show all work for full credit. No calculators, books or notes are allowed. The point value of each problem is given in the margin.

<table>
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<th>problem</th>
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</table>

This exam consists of seven integration problems. In order to maximize your score (and to allow us to assign partial credit) you must

SHOW YOUR WORK CLEARLY.
(12) 1. \[ \int \cos^2(2x) \, dx \]

(14) 2. \[ \int \cos^4 x \, dx \] (Your answer in problem 1 should be helpful in solving this problem.)
(14) 3. $\int xe^{-2x} \, dx$

(14) 4. $\int_{0}^{\infty} e^{-3x} \, dx$
(9) 5(a) Decompose \( \frac{1}{x^2(x^2 + 1)} \) as a sum of “simpler” terms, by the method of partial fractions.

(9) (b) Find \( \int \frac{dx}{x^2(x^2 + 1)} \)
(14) 6. \( \int \frac{\sqrt{x^2 - 4}}{x} \, dx, \quad (x > 1) \)
(14) 7. \[ \int \frac{dx}{\sqrt{x^2 - 4x}} \]