

Stanford University Department of Mathematics

Math 42 — First Midterm

Examiner: Adrian Butscher

Date: 5 February 2008

Duration: 120 minutes

FAMILY NAME: _____

GIVEN NAME(S): _____

STUDENT NUMBER: _____

THE TIME OF YOUR TUTORIAL: _____

THE NAME OF YOUR TA: _____

Jarod Alper

Dung-Huang Nguyen

Yu-Jong Tzeng

Ian Weiner

YOUR SIGNATURE: _____

DO NOT OPEN THIS TEST UNTIL INSTRUCTED TO DO SO.

INSTRUCTIONS:

- Your signature above indicates that you have abided by the Stanford Honour Code while writing this test.
- All questions have equal value (20 points). There are six questions.
- You may quote theorems from your textbook if you make an appropriate reference.
- Show all your work.
- No aids of any kind (e.g. textbooks, notes, calculators, cell-phones) are allowed.

Question	Marks
1	
2	
3	
4	
5	
6	
Total (120 points)	

1. Compute the integral $\int \frac{dx}{x^{8/15}(x^{1/3} + x^{1/5})}$.

2. Compute the integral $\int \sin^2(2x) \sin(x) dx$.

3. Compute the integral $\int \frac{x^3}{(x-1)(x+1)^2} dx$.

4. Write down the **form** of the partial fraction expansion (i.e. that which is given to you by the relevant “guiding principle” — don’t actually solve for the coefficients in the expansion) for each of the following rational functions.

(a) $\frac{1}{(x-1)(x-2)(x-3)}$

(b) $\frac{1}{(x^2+1)^2(x-1)^2}$

$$(c) \frac{1}{(x^2 + 2x + 2)(x^2 + 2x - 3)}$$

$$(d) \frac{1}{x^3 + 1}$$

5. Define the function $P(x) \equiv \int_0^x e^{-t^2} dt$. Express the following quantities in terms of P .

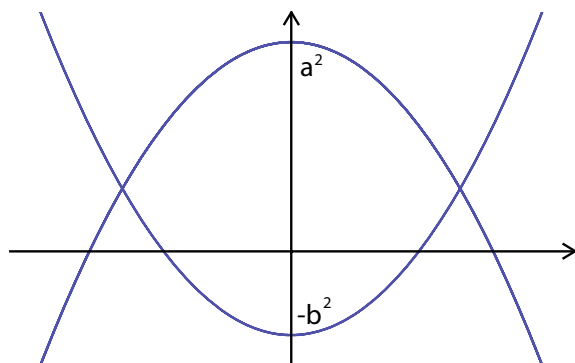
(a) $\int_{1/2}^{3/2} e^{-4t^2} dt$

(b) The antiderivative of the function $f(x) = e^{-x^2}$ that has the value 1 at $x = 1$.

(c) The function $g(x) = 2xe^{-x^4}$.

(d) $\int_{-1}^0 e^{-t^2-2t-2} dt$

6. Find the area of the region between the curves $y = -x^2 + a^2$ and $y = x^2 - b^2$ pictured below.



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