

**Mathematics 19B; Winter 2002; V. Ginzburg
Practice Midterm II**

1. For each of the ten questions below, state whether the assertion is *true* or *false*:

- (a) The volume of the solid obtained by rotating the region bounded by $y = f(x)$, $x = a$, and $x = b$ about the x -axis is equal to $\pi \int_a^b f(x)^2 dx$.
- (b) The work done in moving the object from a to b is equal to $\int_a^b f(x) dx$, where $f(x)$ is the force.
- (c) The integration by parts formula reads

$$\int f'(x)g(x) dx = f(x)g(x) + \int f(x)g'(x) dx.$$

- (d) $\int \tan x dx = \ln(\sec x) + C$.
- (e) The average value of a function $y = f(x)$ on the interval $[a, b]$ is $\int_a^b f(x) dx$.
- (f) To find the integral $\int e^x \sin x dx$ one should apply the method of integration by parts.
- (g) $\int \frac{dx}{x^2+a^2} = \frac{1}{a} \tan^{-1} \left(\frac{x}{a} \right) + C$.
- (h) To evaluate $\int \sqrt{x^2 - a^2} dx$ one should use the trigonometric substitution $x = a \sin \theta$.
- (i) $\int \ln x dx = x \ln x + C$.
- (j) $\int \sec x dx = \ln |\sec x + \tan x| + C$.

2. Evaluate the following indefinite integrals:

- (a) $\int \frac{\sin \sqrt{x}}{\sqrt{x}} dx$,
- (b) $\int x^2 \ln x dx$,
- (c) $\int \sin^2 x \cos^2 x dx$,
- (d) $\int \frac{x^2}{\sqrt{4-x^2}} dx$,
- (e) $\int \frac{3x^2-7x-2}{x^3-x} dx$,
- (f) $\int \frac{dx}{x(x^2+1)} dx$.

3. Evaluate the following definite integrals:

- (a) $\int_0^{\frac{\pi}{2}} e^{\sin x} \cos x dx$,
- (b) $\int_0^1 x \tan^{-1} x dx$,
- (c) $\int_{-1}^1 x^3 \sqrt{x^2 + 4} dx$,
- (d) $\int_{-1}^4 \frac{x-19}{x^2-3x-10} dx$.