



Math 141 Tutorial 6

Problem (Trigonometric Integrals)

Useful trigonometric identities

1. $\sin^2 x + \cos^2 x = 1$

2. $\sin 2x = 2 \sin x \cos x$

3. $\cos 2x = \cos^2 x - \sin^2 x = 2 \cos^2 x - 1 = 1 - 2 \sin^2 x$

4. $\sin^2 x = \frac{1 - \cos 2x}{2}$

5. $\cos^2 x = \frac{1 + \cos 2x}{2}, \quad \tan^2 x + 1 = \sec^2 x$

Evaluate the following integrals

1. $\int \sin^4 x \cos x \, dx$	2. $\int \sin^2 x \cos^3 x \, dx$	3. $\int \sin^2 x \cos^2 x \, dx$
4. $\int \tan^3 x \sec^2 x \, dx$	5. $\int \tan^2 x \sec^3 x \, dx$	6. $\int \sqrt{\sec x} \tan x \, dx$

Complex numbers part 1

1.

Separate into real and imaginary parts: $\frac{1 + 4i}{3 + i}$.

2.

Extract the square root of the complex numbers $21 - 20i$.

3.

Find the multiplicative inverse of $4 + 3i$ or $(4, 3)$.

4.

Find the value of x and y in each of the following:

- (i) $x + 3i + 3 = 5 + yi$ (ii) $x + 2yi = ix + y + 1$
(iii) $(x, y) (1, 2) = (-1, 8)$ (iv) $(x, -y) (3, -4) = (3, -29)$

5.

Find the conjugate of each of the following:

- (i) $-2 + 3i$ (ii) $(1 + i)(-2 - i)$
(iii) $-3i(2 + 5i)$ (iv) $(-5 + 3i)(2 - 3i)$

6.

Find the magnitude (Modulus) of the following:

- (i) -2 (ii) $3 + 2i$ (iii) $5i$ (iv) $(2, 0)$
(v) $(-2, 1)$ (vi) $(-2, -1)$ (vii) $\frac{1 + 2i}{2 - i}$
(viii) $\frac{(3 - 5i)(1 + i)}{4 + 2i}$

7. Express of the following complex number in the polar (Trigonometric) form:

- (i) $2 + 2\sqrt{3}i$ (ii) $1 - i$ (iii) $-1 - i$