# MATH 162 Solutions: QUIZ IX

1. *[50 pts]* Answer any five of the following problems. You may answer all six to earn extra credit. Find the *indefinite integral* of each of the following functions:



*Solution:*





*Solution:*





*Solution:*



Next, let t = cos 3x.

 

*Solution: Let t = x2. Then dt = 2x dx. So x dx = (1/2) dt*



Next, let y = t + 1.



*Solution: Let u = e2x. Then du = 2e2x d.x So e2x dx = ½ du*





*Solution: Let u = arctan x. Then du = 1/(1+x2) du. Hence:*



1. *[12 pts] Express in the form a + bi. Simplify fully*
2. (i )- i

*Solution:*



1. e(7 /6) i

 *Solution:*



1. 81 e(2015) i

*Solution:*



1. *[10 pts]*  *Using Euler’s formula*, find a formula for sin (4x) in terms of sin x and cos x.

*Solution:*

*Since exi = cos x + i sin x, we have:*

*e4xi = (cos x + i sin x)4 = (cos x)4 + 4(cos x)3 i sin x + 6 (cos x)2 i2 (sin x)2 +*

*4(cos x) i3 (sin x)3 + (i4) (sin x)4 =*

*(cos x)4 + 4 (cos x)3 (sin x) i– 6(cos x)2(sin x)2 – 4 (cos x)(sin x)3 i + (sin x)4*

*But Euler’s formula tells us that e4xi = cos(4x) + i sin(4x).*

*Thus sin(4x) = 4 (cos3 x )(sin x) – 4(cos x)(sin x)3*

*The imaginary number is a fine and wonderful resource of the human spirit, almost an amphibian between being and not being.*

- Gottfried Wilhelm Leibniz (1646-1716)