Complex Numbers   Name______________________________

1. Perform the following calculations and simplify your final answer:

A. $(2+3i)(1-2i)$ B. $\dfrac{5}{3-2i}$ C. $(1+i)^{20}$

2. Express $e^{(3+4i)t}$ in the form $a+bi$.

3. Express $-\dfrac{5}{2}+\dfrac{5\sqrt{3}}{2}i$ in the form $Re^{i\theta}$.

In problems 4 and 5 you will derive some formulas by computing something in two different ways, expressing each answer using Euler's formula, and then equating the results. The final step uses the fact that $a+bi=c+di$ tells us that $a=c$ and $b=d$.

4. A. Use Euler's formula to rewrite $e^{i(2\theta)}$.

B. Use $e^{i(2\theta)} = \left(e^{i\theta}\right)^{2}$ to rewrite $e^{i(2\theta)}$ in the form $a+bi$.

C. Set your answers to parts A and B equal to each other to derive two famous trig identities.

5. A. Use u-substitution to evaluate $\int e^{(a+bi)x}dx$. Rewrite your answer using Euler's formula.

B. Rewrite $\int e^{(a+bi)x}dx$ as the sum of two integrals using algebra.
Hint: $e^{(a+bi)x} = e^{a} \cdot e^{bxi}$

C. Set your answers to parts A and B equal to each other to derive formulas 8 and 9 from the integral table.