Assignment 18: Integration Techniques (7.1-5) **Name**___________________

Please provide a handwritten response.

1a. Using trigonometric identities we can often show that two different-looking results for an integral are both correct. Evaluate $\int \cos^3(x)\sin^2(x)\,dx$ by hand and record the result below.

1b. Evaluate this integral using *Derive* by **Author**ing int((cos(x))^3(sin(x))^2,x). Simplify using = and record the result below. Does it look the same as the answer in part **a**?

1c. We can control the way *Derive* simplifies trigonometric functions. Click **Declare→Simplication settings**. Find **Trig Powers** and click the arrow to its right; select **Sines** and click **OK**. Now, select *Derive*'s answer from **1b** and simplify using =. Record the result below; was *Derive*'s result correct after all?

2a. A challenging integral to do by hand, $\int e^{2x}\cos(4x)\,dx$ is easily found using *Derive*. **Author** exp(2x)cos(4x) then use ∫ to find the indefinite integral with *x* as the variable. Click **OK** followed by = to simplify the result and record *Derive*'s answer below.

2b. Try **2a** again but this time click **Simplify** instead of clicking **OK** after setting up the indefinite integral. Is the result the same? Try it again by **Author**ing int(exp(2x)cos(4x),x) followed by =. Is the result again the same? What differences, if any, are found?

3a. The inverse tangent function is denoted in *Derive* by atan; **Author** int(exp(x)atan(exp(2x),x) to integrate $\int e^x \arctan\left(e^{2x}\right) dx$. Simplify the result with = and record the result below.

3b. Differentiate *Derive*'s result from **3a** by highlighting it and clicking ∂ followed by **Simplify**. (We could also have clicked **OK** then = to simplify.) Was *Derive*'s integration correct in **3a**? Explain how we know.

4a. Investigate *Derive*'s ability to evaluate $\int x^3 e^{5x} \cos(3x)\, dx$. **Author** int(x^3exp(5x)cos(3x),x) and simplify using =. Record below just the denominator of the leading fraction in *Derive*'s result.

4b. Now check the answer using ∂ and clicking Simplify. Record the result below; does this seem correct? Explain. (Is the result simplified?)

5a. *Derive* is also capable of performing partial fraction decomposition. Enter the fraction $\dfrac{x^2+2x-1}{(x-1)^2\left(x^2+4\right)}$ with **Author** (x^2+2x-1)/((x-1)^2(x^2+4)). Click **Simplify→Expand** to decompose the fraction. Record the result below; is it correct? It can be combined together again using =.

5b. Integrate both the original fraction and the partial fraction decomposition from above. Record the results below. Does it seem to make a difference to *Derive* which one is integrated? If we were doing it by hand, which one would we integrate?