

NAME _____ 9:20, 10:20, 12:20
 Circle your class time.

- PLEASE NOTE: You may use the table of integrals provided wherever it applies. You must state the number of the formula that you are using as well as values for each symbol used in the table entry (e.g. u and a).
- No calculator is allowed. Do not round off answers. If you get $10/6$ as an answer, you should leave your answer as $5/3$. No decimal approximations, please.
- If you have any questions, please raise your hand and ask. The worst that will happen is that I will say, "I can't tell you."
- Do the problems that you find easiest first. Take deep breaths between questions.
- There are 100 points on this exam, and you have 110 minutes.
- I hope you all do well. Good luck!

Question	Points	Points Earned
1	9	
2	9	
3	9	
4	9	
5	9	
6	9	
7	9	
8	9	
9	9	
10	9	
11	10	
TOTAL	100	

Trigonometric Product Formulas:

$$\sin(A) \sin(B) = \frac{1}{2} [\cos(A - B) - \cos(A + B)]$$

$$\cos(A) \cos(B) = \frac{1}{2} [\cos(A - B) + \cos(A + B)]$$

$$\sin(A) \cos(B) = \frac{1}{2} [\sin(A + B) + \sin(A - B)]$$

1. (9 points) Evaluate the integral: $\int_1^2 we^{-w} dw$.

2. (9 points) Evaluate the integral: $\int \frac{\theta^3 + 5\theta}{(\theta^2 - 3)^{\frac{1}{5}}} d\theta$

3. (9 points) Evaluate the integral: $\int \frac{e^{-t} dt}{\sqrt{16 - e^{2t}}}$

4. (9 points) Evaluate the integral: $\int \frac{2x - 4}{x^2 - 3x + 5} dx$.

5. (9 points) Evaluate the integral: $\int t^2 \arctan(t) dt$.

6. (9 points) Evaluate the integral: $\int \frac{3x}{x^2 - x + \frac{3}{16}} dx$.

7. (9 points) Evaluate the integral: $\int e^{5x} \sin(3x) dx$.

8. (9 points) Evaluate the integral: $\int \sin^4(3x) dx$

9. (9 points) Set up and DO NOT EVALUATE the integral that equals the length of the curve given by $xy = \ln(y)$ for $1/3 \leq y \leq 1/2$.

10. (9 points) Rockets use their fuel as they rise and thus become lighter. Suppose that to rise at a constant speed, $v = 3\text{m/sec}$, a small “backyard” rocket must use fuel so that its mass t seconds after liftoff is given by $m(t) = 39(1 - e^{-5t})\text{kg}$. Set up but DO NOT EVALUATE an integral for the work needed to propel the rocket from the ground to a height of 30m above ground level. Draw a picture and label the axes you introduce with a letter, direction and origin.

11. (10 points) A swimming pool is shaped like a paraboloid, that is, the parabola $y = x^2/4$ rotated about the y -axis. It is 4 meters deep at the deepest point. Set up but DO NOT EVALUATE an integral for the work needed to empty the pool if it is full. The density of water is 1000kg/m^3 . Label the picture below or draw your own picture. Label any axes you use with a letter, direction and origin.

