Math 251: Integration Extra

Recitation Week 13

- 1. (Net Change Extra) An airplane is descending. Its rate of change of height is $r(t) = -4t + \frac{t^2}{10}$ meters per second.
 - (a) If A(t) is the altitude of the airplane in meters, how are A(t) and r(t) related?

(b) What physical quantity does
$$\int_{1}^{3} r(t) dt$$
 represent?

- (c) Compute A(3) A(1).
- (d) Explain why you do not know A(t) exactly.
- (e) Explain how you can find A(3) A(1) exactly without knowing A(t) exactly?
- 2. Fill out the blanks below:

•
$$\int x^n dx =$$

• $\int \sin x dx =$
• $\int \cos x dx =$
• $\int \cos x dx =$
• $\int \sec^2 x dx =$
• $\int \csc^2 x dx =$
• $\int \csc^2 x dx =$
• $\int \csc^2 x dx =$
• $\int \frac{1}{\sqrt{1-x^2}} dx$
• $\int \frac{1}{\sqrt{1-x^2}} dx$

UAF Calculus I

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3. For the integral $\int \sin(x)\cos(x) dx$, evaluate it first using $u = \sin(x)$ then using $u = \cos(x)$. Are these really equal? Justify your answer.

4. Evaluate the integrals below.

(a)
$$\int \frac{1}{x^2 + 1} dx$$
 (b) $\int \frac{x}{x^2 + 1} dx$ (c) $\int \frac{x^2 + 1}{x} dx$

(d)
$$\int \frac{\cos(\sqrt{x})}{\sqrt{x}} dx$$
 (e) $\int \frac{x^3}{\sqrt{x^2+1}} dx$ (f) $\int \frac{x^2+1}{\sqrt{x}} dx$