Math 10A
Quiz 5; Friday, 7/13/2018
Time: 3 PM
Instructor: Roy Zhao **Name:** ____________________

Circle True or False. (1 point for correct answer, 0 if incorrect)

1. True **FALSE** Every function has only one antiderivative.

> **Solution:** There are infinitely many antiderivatives that differ by a constant.

2. True **FALSE** The only way to calculate the integral $\int_0^1 x dx$ is by using an antiderivative of x.

> **Solution:** We can also look at the graphical definition and use $1/2bh$ to find the area of the triangle.

Show your work and justify your answers. Please circle or box your final answer.

3. (10 points) (a) (4 points) Find $\dfrac{d}{dx}\displaystyle\int_x^{x^2} \sqrt{1-x}dx$.

> **Solution:** Using FTC, this is $\sqrt{1-x^2} \cdot 2x - \sqrt{1-x} \cdot 1 = 2x\sqrt{1-x^2} - \sqrt{1-x}$.

(b) (3 points) Find $\displaystyle\int \sin^4(x)\cos(x)dx$.

> **Solution:** Let $u = \sin(x)$ so $du = \cos(x)dx$. Then this integral is
>
> $$\int \sin^4(x)\cos(x)dx = \int u^4 du = \frac{u^5}{5} + C = \frac{\sin^5(x)}{5} + C.$$

(c) (3 points) Find $\displaystyle\int \frac{\ln x}{x^3}dx$.

> **Solution:** Integrate by parts with $u = \ln x, dv = \frac{1}{x^3}dx = x^{-3}dx$ to get $du = \frac{1}{x}dx$ and $v = \frac{1}{-2x^2}$ so
>
> $$\int \frac{\ln x}{x^3}dx = \frac{-\ln x}{2x^2} - \int \frac{1}{-2x^3}dx = \frac{-\ln x}{2x^2} - \frac{1}{4x^2} + C.$$