Math 150 Name: ________________________

QUIZ ON CHAPTER 5

INTEGRALS; MATH 150 – SPRING 2017 – KUNIYUKI
105 POINTS TOTAL, BUT 100 POINTS = 100%

Show all work, simplify as appropriate, and use "good form and procedure" (as in class).
Box in your final answers!
No notes or books allowed. A scientific calculator is allowed.

Final answers must not consist of any negative exponents or compound fractions.

1) Evaluate the following integrals. Simplify as appropriate. (47 points total)

a) $\int \frac{\left(w^2+4\right)^2}{w^2}\,dw$ (9 points)

b) $\int \frac{\left[1+\tan^2(\theta)\right]\tan(\theta)}{\sec(\theta)}\,d\theta$ (6 points)

c) $\int 3\sec^2(x)\tan^7(x)\,dx$ (7 points)

d) $\displaystyle\int \frac{\left(2+\sqrt{x}\right)^6}{\sqrt{x}}\,dx$ (8 points)

e) $\displaystyle\int_0^3 \sqrt{9-x^2}\,dx$ (5 points)

(Hint: Do not use the Fundamental Theorem of Calculus.)

f) $\displaystyle\int_0^2 \frac{x^2}{\sqrt{2x^3+9}}\,dx$ (12 points)

Give an exact, simplified fraction as your answer.

2) An astronaut crawls to the edge of a cliff on planet Dork. The edge lies 33 feet above a lake. The astronaut throws down a rock at 30 feet per second.

The acceleration function for the rock is given by $a(t) = -6\,\frac{\text{ft}}{\text{sec}^2}$, which is the [signed] gravitational constant for Dork. The variable t represents time in seconds after the rock was thrown. Find the height function [rule] $s(t)$ for the height of the rock above the lake. $s(t)$ is measured in feet. [Note: Your $s(t)$ rule will only be relevant between the time the rock is thrown and the time the rock hits the lake.] Show all work, as in class. (9 points)

3) Assume that f is an everywhere continuous function on $\mathbb{R}$ such that $\int_{10}^{20} f(x)\,dx = 100$. Evaluate: $\int_{20}^{10} \left[3f(x)-1\right] dx$. (5 points)

4) Evaluate: $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \tan(x)\,dx$. **Answer only is fine.** (2 points)

5) Simplify: $D_x\left(\int_{\pi}^{x} \sin\left(t^2\right) dt\right)$. (2 points)

6) For parts a), b), c), and d), let $f(x) = x^4$. (30 points total)

   a) Approximate $\int_{2}^{4} x^4\,dx$ by using a Right-hand Riemann Approximation (RRA) based on the partition $\{2.0, 2.7, 3.0, 3.6, 4.0\}$. Round off calculations to at least five significant digits. (10 points)

b) Approximate $\int_2^4 x^4\,dx$ by using the Trapezoidal Rule. Use a regular partition with $n = 4$ subintervals. Round off calculations to at least five significant digits. (12 points)

Hint: The Trapezoidal Rule is given by:

$$\int_a^b f(x)\,dx \approx \frac{b-a}{2n}\left[f(x_0)+2f(x_1)+2f(x_2)+\cdots+2f(x_{n-1})+f(x_n)\right], \text{ or}$$

$$\approx \frac{1}{2}\Delta x\left[f(x_0)+2f(x_1)+2f(x_2)+\cdots+2f(x_{n-1})+f(x_n)\right]$$

c) Find the exact value of $\int_2^4 x^4\,dx$ by applying the Fundamental Theorem of Calculus. (5 points)

d) Use part c) to find f_{av}, the average value of f on the x-interval $[2, 4]$, where $f(x) = x^4$. (3 points)

7) Evaluate $\int x(x+5)^{200}\,dx$. Hint: Remember a trick discussed in class.
(10 points)