CHAPTER 5 REVIEW NAME: ________________________

29 July 2018

(1) If f is increasing and concave up on an interval $[a, b]$, is the left-endpoint approximation more accurate or is the right-endpoint approximation more accurate? Why? What if f is increasing and concave down?

(2) Evaluate the limit by interpreting as an integral, where a is an arbitrary constant.

$$\lim_{N\to\infty} \frac{\left(\frac{N+1}{N}\right)^a + \left(\frac{N+2}{N}\right)^a + \ldots + \left(\frac{N+N}{N}\right)^a}{N}$$

(3) Calculate the derivative.

(a) $\dfrac{d}{dx}\displaystyle\int_3^x \sin(t^3)\,dt$

(b) $\dfrac{d}{dx}\displaystyle\int_{4x^2}^9 \frac{1}{t}\,dt$

(4) Express the antiderivative $F(x)$ of $f(x)$ as an integral, given that $f(x) = \sqrt{x^4+1}$ and $F(3) = 0$.

(5) Show that a particle, located at the origin at time $t = 1$ and moving along the x-axis with velocity $v(t) = t^{-2}$, will never pass the point $x = 2$.

(6) Show that a particle, located at the origin at time $t = 1$ and moving along the x-axis with velocity $v(t) = t^{-1/2}$, moves arbitrarily far from the origin after sufficient time has elapsed.

(7) Evaluate the indefinite integral

$$\int \tan x \sec^2 x \, dx$$

in two ways: first using $u = \tan x$ and then using $u = \sec x$. What's going on here?

(8) Evaluate the indefinite integral.

(a) $\displaystyle\int x(x+1)^9 \, dx$

(b) $\displaystyle\int \sin(2x-4) \, dx$

(c) $\displaystyle\int \frac{x^3}{(x^4+1)^4} \, dx$

(d) $\int \sqrt{4x-1}\,dx$

(e) $\int x\cos(x^2)\,dx$

(f) $\int \sin^5 x \cos x\,dx$

(g) $\int \sec^2 x \tan^4 x\,dx$

(h) $\int \frac{dx}{(2+\sqrt{x})^3}$

(9) Evaluate the definite integral.

(a) $\displaystyle\int_0^1 \frac{x}{(x^2+1)^3}\,dx$

(b) $\displaystyle\int_{10}^{17} (x-9)^{-2/3}\,dx$

(c) $\displaystyle\int_{-8}^{8} \frac{x^{15}}{3+\cos^2 x}\,dx$

(d) $\displaystyle\int_0^{\pi/2} \sec^2(\cos\theta)\sin\theta\,d\theta$

(e) $\displaystyle\int_{-4}^{-2} \frac{12x\,dx}{(x^2+2)^3}$

(f) $\displaystyle\int_{1}^{8} t^2\sqrt{t+8}\,dt$

(g) $\displaystyle\int_{0}^{\pi/3} \frac{\sin\theta}{\cos^{2/3}\theta}\,d\theta$

(h) $\displaystyle\int_{-2}^{4} |(x-1)(x-3)|\,dx$