MAT 1575 Calculus II Halleck Fall 2018 Study Questions for Exam II

A complete set of attempts (done in pencil) and corrections (done in ink) carefully put together and organized (be sure to put your name, session day, date and topic on each sheet) earns you 10% bonus on your next midterm exam provided that your attendance is good. *Please be sure to turn this in at the **beginning** of the Exam.*

Instructions for indefinite integrals: i. Evaluate ii. **Check by differentiating!** iii. Determine the critical points for your resulting functions and use the first derivative test to classify them.

Instructions for definite integrals: i. Evaluate. If you use a **substitution** technique, **change the limits to the new variable**. (Do **not** substitute back to original variable!) Answers must be **exact**. ii. Find numeric approximations iii. Sketch graphs of the integrand by evaluating at the endpoints and at the midpoint. iv. Do your answers make sense numerically?

Instructions for Taylor Polynomials: i. Find Taylor polynomial *P*(*x*) of degree n for $f(x)$ centered at $x = a$.

[$f(x) = P(x) + R(x)$; *R*(*x*) is the "error term".] ii. Find $R(x) = \frac{f^{(n+1)}(z)(x-a)^{n+1}}{(n+1)!}$ where $z \in (a, a+1)$

[will appear to be function of *x* & *z*; in reality, *R*(*x*) is solely function in *x* (*z* is *dependent* on *x*)]. iii. Find an expression for *R*(a+1) (will appear to be a "function" of *z*). iv. By maximizing $f^{(n+1)}(z)$ over $z \in (a, a+1)$, find a numeric bound for $|R(a+1)|$. v. Evaluate *f* (a+1) and *P*(a+1) and verify that the |actual error| $= |P(a+1) - f(a+1)|$ is within the bound for $|R(a+1)|$ found in iv.

Quiz 1 **Partial Fraction Decomposition**

1. Evaluate the following indefinite integrals:

a. $\int \frac{3x+7}{x^2+6x+9}\,dx$ b. $\int \frac{5x+6}{x^2-36}\,dx$ c. $\int \frac{3x+2}{x^2+2x-8}\,dx$

Quiz 2

More Partial Fraction Decomposition

1. $\int \frac{6x^2+8x-4}{(x-3)(x^2+6x+10)}\,dx$ 2. $\int_0^1 \frac{x}{(x+1)(x^2+2x+1)}\,dx$

Quiz 3 **Improper Integrals**

1. **a.** $\int_{-4}^{14} \frac{1}{\sqrt[3]{\frac{1}{2}y+1}}\,dy$ **b.** $\int_{-1}^{7} \frac{1}{\sqrt[3]{y+1}}\,dy$

Quiz 4 **More Improper Integrals**

1. a. $\int_0^\infty \frac{2}{(x+2)^3}\,dx$ b. $\int_0^\infty \frac{5}{\sqrt[3]{x+5}}\,dx$ c. $\int_3^5 \frac{3}{\sqrt[3]{(x-3)^4}}\,dx$

Quiz 5 **Taylor Polynomials**

1. Find the Taylor polynomial of degree 2 for the given function, centered at the given number a:

a. $f(x) = e^{-2x}$ at $a = -1$. b. $f(x) = \cos(5x)$ at $a = 2\pi$.

2. Find the Taylor polynomial of degree 3 for the given function, centered at the given number a:

a. $f(x) = 1 + e^{-x}$ at $a = -1$ b. $f(x) = \sin(x)$ at $a = \frac{\pi}{2}$

Quiz 6 **Mean Value Theorem:**

1. **Sketch the function *f*(*x*) over the interval [*a*, *b*] given. Check if the Mean Value Theorem can be applied to *f* on [*a*, *b*]; if so, find a value *c* in [*a*, *b*] guaranteed by the MVT and sketch relevant tangent and secant lines.**

a. $f(x) = \frac{1}{x^2 - 2x + 1}$ on $[0, 2]$. *b.* $f(x) = \sqrt{9 - x^2}$ on $[0, 3]$ *c.* $f(x) = \sin^{-1} x$ on $[-1, 1]$