MAT 201 Test 4, Fall, 2019 Name____________________

100 Points Covers Chapter 4

You know the drill. And remember to circle final answers.

1. (10 pts) Use the limit definition of the definite integral to evaluate $\int_1^4 7x^2\,dx$.

2. (10 pts) Show that $\int_0^3 \left(9-x^2\right)dx = \int_2^{11}\sqrt{y-2}\,dy$ by evaluating each, separately.

3. (20 pts) Evaluate the definite integral: $\int_0^{\frac{2\pi}{3}} \left|\, 2\sin(x)-\sqrt{3}\,\right| dx$.

4. (10 pts) Evaluate $\int\limits_0^4 (3x-1)^5\,dx$.

5. Evaluate one of the following indefinite integrals:

   a. (20 pts) $\int x^2(3x-1)^5\,dx$

   b. (20 pts) $\int \frac{(6x-5)}{\sqrt[3]{9x^2-15x}}\,dx$

6. (10 pts) Evaluate the definite integral $\int_0^{\frac{\pi}{3}} \sec^5(x)\sin(x)\,dx$

7. Perform the indicated differentiation:

   a. (10 pts) $\frac{d}{dx}\int_3^x \sin^3\left(t^2\cos(t)\right)dt$

   b. (10 pts) $\frac{d}{dx}\int_0^{x^2+2x} \sin^3\left(t^2\cos(t)\right)dt$

Bonus Section Answer any 15-points'-worth of the following:

Bonus 1 (10 pts) Sketch the graph of $f(x)=2\sin(x)-\sqrt{3}$, showing all intercepts, extrema and inflection points.

Bonus 2 (10 pts) Sketch the graph of $g(x)=\left|2\sin(x)-\sqrt{3}\right|$, showing all intercepts, extrema and inflection points.

Bonus 3 (5 pts) (Evaluate $\frac{d}{dx}\int_{x^5}^{x^2+2x} \sin^3\left(t^2\cos(t)\right)dt$

Bonus 4 (10 pts) Use the graph of one function to show what's going on with the two integrals in #2.

Bonus 5 (5 pts) Find an upper and lower bound for $\int_0^{\frac{\pi}{2}} \left(2\sin(x) - \sqrt{3}\right) dx$, without evaluating the integral itself.

Bonus 6 (5 pts) Confirm that the hypotheses of the Mean Value Theorem hold for $f(x) = 2\sin(x) - \sqrt{3}$ on $\left[0, \frac{\pi}{2}\right]$, and find the c that is promised in the conclusion of the theorem.

Bonus 7 (5 pts) Compute the derivative of $f(x) = \sqrt{5x}$ by the limit definition.

Bonus 8 (10 pts) Use the tangent line to approximate $\cos\left(32^0\right)$.

Bonus 9 (5 pts) Explain, using the diagram, below, how Newton's Method takes us from our first guess, x_1, to our second guess, x_2. Then write the general recursion for Newton's Method.