Calculus I	**Name:**
Study Guide 21	**Class:**
Due Date:	**Score:**

No Work $\Leftrightarrow$ No Points

Use Pencil Only $\Leftrightarrow$ Be Neat & Organized

1. (2 points) State the **Fermat's Theorem** for calculus clearly.

2. (4 points) Find the minimum and maximum value of the function $f(x) = 3x^{2/3} - 2x$ on the interval $[-1, 1]$.

2. _____

3. (4 points) Find the first and second derivatives for the function $f(x) = x\sqrt{x+3}$, then discuss all extrema and inflection points.

3. _____

4. (5 points) Find two numbers such that their sum is minimum and they are reciprocal of each other. You must use the first and second derivative tests to support your answers.

4. _____

5. (4 points) Find the exact point on the graph of $y = \sqrt{x}$ that is the closest to the point $(4, 0)$.

5. _____

6. (4 points) Verify that the hypotheses of Mean-Value Theorem are satisfied for the function $f(x) = \sqrt[3]{x^2}$ on the interval $[0, 1]$, and find all values of c in the given interval that satisfy the conclusion of the theorem.

6. _____

7. (2 points) Find $\int \sqrt{x}\, dx$.

7. _____

8. (2 points) Find $\int \frac{1}{\sqrt{x}}\, dx$.

8. _____

9. (3 points) Find $\int (\sqrt[3]{x} + \sin x\,) dx$.

9. _____

10. (3 points) Find $\int \left(\frac{1}{\sqrt[4]{x}} - \cos x \right) dx$.

10. _____

11. (3 points) Find $\int (x - \sec x \tan x\,)\, dx$.

11. _____

12. (3 points) Find $\displaystyle\int \frac{x^4+1}{x^2}\,dx.$

12. _____

13. (3 points) Find $\displaystyle\int \frac{\sqrt[3]{x}-1}{\sqrt{x}}\,dx.$

13. _____

14. (2 points) Find $\displaystyle\int (\sin^2 x + \cos^2 x\,)dx.$

14. _____

15. (3 points) Find $\displaystyle\int \left(1+\tan^2 x\,\right)\,dx.$

15. _____

16. (3 points) Find $\displaystyle\int \left(-1-\cot^2 x\,\right)\,dx.$

16. _____