Clearly mark answers to the multiple choice problems on your paper and your scantron.

1. [5 pts] Compute the limit for $\lim_{x \to \infty} \frac{\ln x}{\sqrt{x}}$ .

(a) 0

(b) $\frac{1}{2}$

(c) $\infty$

(d) $-\infty$

(e) none of these

---

2. [5 pts] Identify the inflection values of $f(x) = \frac{1}{10} x^6 - x^4$.

(a) $x = -2, 0, 2$

(b) $x = -2, 2$

(c) $x = 0, 2$

(d) $x = 0$

(e) none of these

3. [5 pts] Compute the limit for $\lim_{x \to 0} \left(1 - \frac{1}{2}x\right)^{2/x}$ .

(a) $\frac{1}{e}$

(b) $-1$

(c) $e$

(d) 1

(e) none of these

---

4. [5 pts.] Find $c$ such that $f'(c) = -\frac{1}{5}$ for $f(x) = \frac{1}{x}$ on $[1, 5]$.

(a) $-\sqrt{5}$

(b) $\sqrt{5}$

(c) 5

(d) $-5$

(e) none of these

5. [5 pts] The recursion equation $x_{t+1} = x_t^2 + 4x_t + 2$ has two fixed points $x_1^* = -1$ and $x_2^* = -2$. Classify each fixed point.

(a) Both are locally stable.

(b) Both are unstable.

(c) $x_1^* = -1$ is locally stable; $x_2^* = -2$ is unstable

(d) $x_1^* = -1$ is unstable; $x_2^* = -2$ is locally stable

(e) none of these

---

6. [5 pts] The recursion equation $x_{t+1} = x_t^2 + 4x_t + 2$ has two fixed points $x_1^* = -1$ and $x_2^* = -2$. Determine if $x_1^* = -1$ is approached with or without oscillations.

(a) The sequence displays oscillations near $x_1^* = -1$.

(b) The sequence does not display oscillations near $x_1^* = -1$.

(c) There is no way to tell.

(d) Recursive sequences do not display oscillations near fixed points.

(e) none of these

7. [5 pts.] Compute the limit for $\lim_{x \to 0^+} \left( \frac{1}{\sin^2 x} - \frac{1}{x} \right)$.

(a) 3

(b) $\infty$

(c) $\frac{1}{3}$

(d) 1

(e) none of these

---

8. [5 pts] Solve the recursion equation $a_{n+1} = \frac{1}{2} a_n - 1; \quad a_0 = -\frac{1}{2}$ .

(a) $a_n = -\frac{3 - 2^{n+2}}{2^{n+1}}$

(b) $a_n = -\frac{2^{n+2} - 3}{2^{n+1}}$

(c) $a_n = -\left(\frac{3}{2}\right)^n$

(d) $a_n = -\left(\frac{2}{3}\right)^n$

(e) none of these

9. [5 pts] Find all absolute extrema for $f(x) = 2x^3 + x^2 + x$ over the interval $\left[-2, \frac{1}{3}\right]$.

a. Absolute max: 1; Absolute min: - 14

b. Absolute max: 1; Absolute min: - 2

c. Absolute max: $\frac{14}{27}$; Absolute min: - 2

d. Absolute max: $\frac{14}{27}$; Absolute min: - 14

e. none of these

---

10. [5 pts] Find all absolute extrema that exist for $f(x) = x + \frac{1}{x}; \quad x > 0$.

(a) Absolute minimum of 1

(b) Absolute minimum of 2

(c) Absolute maximum of 1

(d) Absolute maximum of 2

(e) none of these

11. [5 pts] Find all absolute extrema that exist for $f(x) = \frac{1}{(x-2)^2}$ on $[1, 4]$.

(a) Absolute minimum at $x = 1$

(b) Absolute minimum at $x = 4$

(c) No absolute extrema exist

(d) Absolute maximum at $x = 1$

(e) none of these

---

12. [5 pts] A continuous function defined for all $x$ has the following properties:

- ♦ $f$ is increasing, $f$ is concave down, $f(4) = 1$, $f'(4) = \frac{1}{3}$

Is it possible that $f'(1) = \frac{1}{2}$ ?

(a) No, because $\frac{1}{2} > \frac{1}{3}$

(b) Yes, because $\frac{1}{2} > \frac{1}{3}$

(c) Yes, because the limit isn't defined

(d) No, because the limit isn't defined

(e) none of these

13. [10 pts.] A rectangular box with a top and square base is to be constructed at cost of 20 cents. If the material for the bottom cost 3 cents per square foot, the material for the top costs 2 cents per square foot, and the material for the sides costs 1.5 cents per square foot, find the dimensions of the box of maximum volume that can be constructed. (You must use calculus!)

14. [10 pts.] Find all fixed points for the recursion $x_{t+1} = 1 - \frac{1}{2}x_t$, and use the method of cobwebbing to find $\lim_{t \to \infty} x_t$ if $x_0 = \frac{1}{2}$. Draw you graph carefully and neatly!

15. [20 pts.] Given $f(x) = \dfrac{x^2}{1 + x}$,

(a) Find all asymptotes and intercepts.

(a) Find all intervals of increasing and decreasing, and local extrema.

(b) Find all intervals of concavity and inflection.

(c) Sketch a graph using only the information listed in parts (a), (b) and (c).

MATH 147 EXAM III

VERSION A

NAME ________________________________________

SECTION # ______________

SEAT # ___________

Clearly mark answers to the multiple choice problems on your paper and your scantron.

In order to obtain full credit for partial credit problems, all work must be shown. Credit will not be given for an answer not supported by work.

"An Aggie does not lie, cheat or steal or tolerate those who do."