

Name _____ Rec. Instr. _____
Signature _____ Rec. Time _____

Math 220
Exam 2
October 20, 2016

No books, calculators, or notes are allowed. Please make sure that your cell phone is turned off. You will have 75 minutes to complete the exam. Unless instructed otherwise, **show your work.**

Problem	Points	Points Possible	Problem	Points	Points Possible
1		13	6		8
2		8	7		10
3		9	8		18
4		8	9		5
5		6	10		15

Total =

1. Differentiate the following functions. You do not need to simplify your answers.

A. (7 points) $w(x) = x^3 e^{1/x}$

B. (6 points) $h(x) = \tan^{-1}(x^2)$.

2. (8 points) Use logarithmic differentiation to find $\frac{dy}{dx}$ if $y = x^{2x}(1 - x)^7$.

- 3.** (9 points) Use implicit differentiation to find an equation for the tangent line to the curve $xy + 7 = x^3 + y^3$ at the point $(2, 1)$.

- 4. A.** (5 points) Find the linear approximation of $f(x) = \sqrt[3]{x}$ near $x = 8$.

- B.** (3 points) Use your answer from Part **A** to estimate $\sqrt[3]{8.1}$. (No need to simplify your answer.)

5. (6 points) The volume of a sphere is given by $V = \frac{4}{3}\pi r^3$. Estimate the change in volume by calculating dV , given that $r = 3$ inches and $dr = \frac{1}{12\pi}$ inches.
6. (8 points) Determine the absolute minimum and absolute maximum value of the function $f(x) = x^3 - 3x$ over the interval $[0, 2]$.
7. (10 points) A rocket is launched vertically upward from a point 3 miles east of an observer on the ground. Use related rates to determine the rate that the distance between the rocket and the observer is increasing when the rocket is 4 miles above the ground and traveling 500 miles per hour (vertically upward).

8. Let $g(x) = x^5 - \frac{20}{3}x^3$.

A. (4 points) Find the critical points of $g(x)$ and draw a number line showing where $g'(x)$ is positive and negative.

B. (2 points) Give the open interval(s) where $g(x)$ is increasing:

C. (3 points) Classify each critical point as a local minimum, local maximum or neither.

D. (4 points) Draw a number line showing where $g''(x)$ is positive and negative.

E. (2 points) Give the open interval(s) where $g(x)$ is concave up:

F. (3 points) Give the x -coordinates of all inflection points of $g(x)$:

9. (5 points) Evaluate $\lim_{x \rightarrow -\infty} \frac{x+3}{\sqrt{x^2-1}}$

10. Let $f(x) = \frac{2x^2-6x}{4-x^2}$. Given: $f'(x) = \frac{-2(3x^2-8x+12)}{(4-x^2)^2}$.

A. (2 points) Give the equation of the horizontal asymptote for $f(x)$ (if any).

B. (2 points) Give the equations of all vertical asymptotes for $f(x)$ (if any).

C. (2 points) Give the x -intercepts (if any):

D. (1 point) Give the y -intercept (if any):

E. (2 points) Find all critical points of $f(x)$ (if any).

F. (2 points) Show that $f(x)$ is always decreasing on its domain.

G. (4 points) Make a rough sketch of the graph of $f(x)$, including the asymptotes and intercepts. Do not worry about plotting inflection points.

