(4) - MAC 3233 Exam 2 UCF Dr. Rapalje NAME ________________ (4)

Show **ALL** work as necessary on separate paper. S.S.# ________________

Turn in all work sheets.

No CALCULATORS.

Points

(10) (8) 1. Test for symmetry about x axis, y axis, + origin.
Give vertical + horizontal asymptotes

a) $y = \dfrac{x}{x^2-9}$ b) $y = \dfrac{2x^2}{x^2+1}$

(12) 2. Given $y = \dfrac{x^2}{1-x}$, find y' and find all values of x that could be relative maximums, minimums, or asymptotes. (You need not distinguish!)

(12) 3. For $y = 3x^4 - 4x^3 + 1$, find a) relative maximums, b) relative minimums, c) where is the graph increasing, d) decreasing,

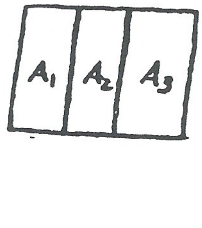
(11) 4. Find the absolute maximum and the absolute minimum value of $f(x) = x^3 - 3x^2$ on $[3, 3]$.

(15 5. (See #3). For $y = 3x^4 - 4x^3 + 1$, a) find all possible points of inflection. b) Where is the graph concave upward? c) downward? d) Which possible points of inflection actually are? e) sketch graph. (make use of #3 and 5)

(12) 6. Given the demand equation $p = \$400 - 2q$.
a) What is the revenue equation?
b) For what output q is there a maximum revenue? What price p?
c) When is marginal revenue increasing?

(10) 7. For a manufacturing company, total fixed costs are \$1200, material + labor costs are \$3 per unit, and the demand equation is $p = \dfrac{96}{\sqrt{q}}$. What level of output will maximize profit?

(10) 8. A rectangular field is to be enclosed by a fence and equally divided into three parts by two fences parallel to one pair of sides, as shown. If a total of 1200 ft of fencing is to be used, find the dimensions of the field and the area if area is to be maximized.



(A_1, A_2, and A_3 are identical in area and dimensions.)

1a) $y=\frac{x}{x^2-9}$

x axis: $-y=\frac{x}{x^2-9}$ No.

y axis: $y=\frac{(-x)}{(-x)^2-9}$ No

Origin: $(-y)=\frac{(-x)}{(-x)^2-9}$ Yes

Vert. Asymp. $x=\pm 3$
Horiz. Asymp $y=0$

b) $y=\frac{2x^2}{x^2+1}$

x axis: $-y=\frac{2x^2}{x^2+1}$ No

y axis: $y=\frac{2(-x)^2}{(-x)^2+1}$ Yes.

Origin: $-y=\frac{2(-x)^2}{(-x)^2+1}$ No

Vert. Asymp: None
Horiz. Asymp: $y=2$

2. $y=\frac{x^2}{1-x}$

$y'=\frac{(1-x)2x-x^2(-1)}{(1-x)^2}$

$y'=\frac{2x-2x^2+x^2}{(1-x)^2}$

$=\frac{2x-x^2}{(1-x)^2}=\frac{x(2-x)}{(1-x)^2}$

Possible rel max, min, or asymps: at $x=0,1,2$

3. $y=3x^4-4x^3+1$

$y'=12x^3-12x^2$

$=12x^2(x-1)=0$

$x=0 \quad x=1$

y': $-$ 0 $-$ 1 $+$

a) No Rel Max
b) Rel min at $x=1, y=0$
c) Increasing $(1,\infty)$
d) Decreasing $(-\infty,1)$

4. $f(x)=x^3-3x^2$

$f'(x)=3x^2-6x=0$

$3x(x-2)=0$

$x=0,\ x=2$

Possible Max or Min.

$f(-3)=-27-27=-54$

$f(3)=27-27=0.$

$f(0)=0$

$f(2)=8-12=-4$

Maximum $=0$
Minimum $=-54$

5. $y=3x^4-4x^3+1$

$y'=12x^3-12x^2$

$y''=36x^2-24x=0$

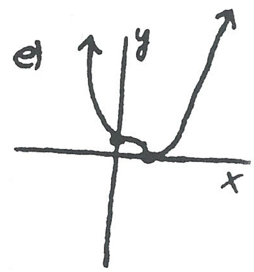
$12x(3x-2)=0$

a) $x=0 \quad x=2/3$

y'': $+$ 0 $-$ $2/3$ $+$

b) upward $(-\infty,0)\cup(2/3,\infty)$
c) Downward $(0,2/3)$
d) Both are.

e)



6. $p=400-2q$

a) Rev $=pq=400q-2q^2$

b) Rev$'=400-4q=0$

$q=100$

Price $p=400-200=\$200$

c) Marg. rev $=400-4q=\frac{dr}{dq}$

$\left(\frac{dr}{dq}\right)'=-4$ Always decreasing.

7. Profit = Rev − cost

$P=pq-c$

$P=\frac{96}{\sqrt{q}}\cdot q-(1200+3q)$

$P=96q^{1/2}-1200-3q$

$P'=48q^{-1/2}-3=0$

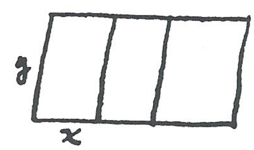
$\frac{48}{\sqrt{q}}=3$

$3\sqrt{q}=48$

$\sqrt{q}=16$

$q=256$

8.



A = maximized.

$=3xy$

where $4y+6x=1200$

$4y=1200-6x$

$y=300-\frac{3}{2}x$

$A=3x(300-\frac{3}{2}x)$

$=900x-\frac{9}{2}x^2$

$A'=900-9x=0$

$x=100'$

$y=300-\frac{3}{2}\cdot 100$

$y=150$

Field is $300'\times 150'$