Math 165	Final Exam	Lowman	Fall 2006

- 1. A manufacturer can produce can openers at a cost of **\$6** each and estimates that if they are sold for p dollars a piece, consumers will buy approximately $D(p) = 6000e^{-.05p}$ can openers a month. Find the profit function then determine at what price should the can openers be sold in order to maximize profit?
 - (a) answer not listed, correct answer is:
 - (b) \$25
 - (c) \$26
 - (d) \$27
 - (e) \$28

- 2. Find the critical points of the functions $f(x, y) = 12x^2 4y^3 + 24xy + 20$ and classify each as a relative maximum, a relative minimum, or a saddle point.
 - (a) answer not listed, correct answer is:
 - (b) (2,0) relative minimum; (0,2) relative maximum
 - (c) (0,0) saddle point; (2,2) relative minimum
 - (d) (0,0) saddle point; (2,-2) relative minimum
 - (e) (0,0) relative minimum; (2,2) saddle point

3. Use these data to predict the GDP in the year **2008** if the GDP is increasing exponentially. GDP in billions is:

Year	2001	2004
GDP in billions	100	200

(a) answer not listed, correct answer is:

(b) 200 billion

(c) 300 billion

- (d) 400 billion
- (e) 500 billion

- 4. Find the minimum value of f(x, y) = 8x + 2ysubject to the constraint xy = 400
 - (a) answer not listed, correct answer is:
 - (b) 40
 - (c) 30
 - (d) 20
 - (e) 10

- 5. $f(x) = \frac{\sqrt{x+1}-1}{x}$, find $\lim_{x \to 0} f(x)$.
 - (a) answer not listed, correct answer is:
 - (b) **x**
 - (c) 2
 - (d) $\frac{1}{2}$
 - (e) 0

6. $C(q) = 0.2q^2 + 3q + 900$ and q = q(t). Given that at t = 5, $\frac{dq}{dt} = 3$ and q(5) = 10 find $\frac{dC}{dt}$ at t = 5.

- (a) answer not listed, correct answer is:
- (b) 18
- (c) 19
- (d) 20
- (e) 21

- 7. Find the slope of the tangent line to the graph of $3xy^2 + 4y = 10$ at the point (2,1).
 - (a) answer not listed, correct answer is:
 - (b) $\frac{-3}{14}$

 - (c) $\frac{-3}{16}$ (d) $\frac{-3}{18}$

 - (e) $\frac{5}{13}$

- 8. $f(x) = 2x^3 12x$, where $1 \le x \le 3$. Determine the locations and values of the absolute maximum and minimum for f(x). Organize your work in a table as demonstrated in lectures.
 - (a) answer not listed, correct answer is:
 - (b) absolute max = 0 absolute min = -10
 - (c) absolute max = 18 absolute min = -10
 - (d) absolute max = 10 absolute min = -8
 - (e) absolute max = 18 absolute min = -8

- 9. For some $f(x) = 3x^2 2x^3$. Find the relative extrema of f.
 - (a) answer not listed, correct answer is:
 - (b) rel max at x = 1 and rel min at x = 0
 - (c) rel max at x = 0 and rel min at x = -1
 - (d) rel max at x = 3/2 and rel min at x = 2/3
 - (e) rel max at x = 2/3 and rel min at x = 0

- 10. For some f(x), $f'(x) = x^2 + 2x 8$. Find where f(x) is increasing and concave up.
 - (a) answer not listed, correct answer is:
 - (b) x < -4
 - (c) x < -2
 - (d) x < -1
 - (e) x > 2

- 11. Use logarithmic differentiation to find f'(x) at x = 1 if $f(x) = (3 + 2x)^x$.
 - (a) answer not listed, correct answer is:
 - (b) 5 ln 5 + 2
 - (c) $2 \ln 2 + 5$
 - (d) $2 \ln 2 + 2$
 - (e) $5 \ln 5 + 5$

12. Write the **geneneral form** of the Power Rule, Exponential Rule and Log Rule for *differentiation*.

Find $\frac{df}{dx}$ at x = 1 for the following functions and box your answer. 13. $f(x) = (x^2 + x)^{1/3}$

- 14. $f(x) = \ln(x^2 + x)$
- 15. $f(x) = e^{x^2 + x}$

16. Write the **geneneral form** of the Power Rule, Exponential Rule and Log Rule for *integration*.

Find the following indefinite integrals.

17. $\int (x^6 + x^2)(3x^7 + 7x^3)^{10}dx$

18.
$$\int 21(x^6+x^2)e^{(3x^7+7x^3)}dx$$

19.
$$\int \frac{21(x^6+x^2)}{(3x^7+7x^3)} dx$$

20.
$$\int \frac{x}{x-1} dx$$