MATH 151, FALL SEMESTER 2011
COMMON EXAMINATION 3 - VERSION B

Name (print): ______________________ Instructor's name: ______________________

Signature: ______________________ Section No: ______________________

Part 1 – Multiple Choice (13 questions, 4 points each, No Calculators)

Write your name, section number, and version letter (**B**) of the exam on the ScanTron form.
Mark your responses on the ScanTron form and on the exam itself

1. The electric field between parallel plates produces the acceleration $a(t) = 5\cos(t)$ cm/sec^2 on a charged particle, where t is in seconds. If the particle has initial position $x(0) = 3$ cm and initial velocity $v(0) = 2$ cm/sec, where is the particle at time $t = \pi$ sec?

a. $x(\pi) = -2\pi + 3$ cm
b. $x(\pi) = 2\pi + 3$ cm
c. $x(\pi) = 2\pi + 13$ cm
d. $x(\pi) = 2\pi + 8$ cm
e. $x(\pi) = -2\pi - 8$ cm

2. Find all solutions of $\ln(x) + \ln(x+2) = \ln(15)$.

a. $x = -5, 3$ only
b. $x = -5, 0$ only
c. $x = 3$ only
d. $x = -5$ only
e. $x = 0, 3$ only

3. Compute $\arcsin\left(\cos \frac{5\pi}{4}\right)$.

a. $-\frac{1}{4}\pi$
b. $\frac{1}{4}\pi$
c. $\frac{3}{4}\pi$
d. $-\frac{5}{4}\pi$
e. $\frac{5}{4}\pi$

4. Compute $\lim_{x\to\infty}\left[\ln(4+2x)-\ln(5+3x)\right]$

a. 0
b. $\ln\frac{4}{5}$
c. $\ln\frac{2}{3}$
d. $\frac{\ln 4}{\ln 5}$
e. $\frac{\ln 2}{\ln 3}$

5. A shrimp farm starts off with 500 shrimp. The number of shrimp quadruples after 8 weeks (to 2000 shrimp). Assuming an exponential growth, how many shrimp are there after 12 weeks?

a. 3000
b. 4000
c. $500e^{6}$
d. $500e^{1/6}$
e. $500e^{(\ln 4)2/3}$

6. If $f(x) = \ln\left[(1+x^2)^{1/2}\right] - \arctan(x)$, then $f'(x) =$

a. $\frac{x+1}{1+x^2}$
b. $\frac{-1}{2(1+x^2)}$
c. $\frac{1-x}{1+x^2}$
d. $\frac{x-1}{1+x^2}$
e. $\frac{1}{2(1+x^2)}$

7. Find the line tangent to $y = \frac{1}{(\ln x)^2}$ at $x = e$. Its y-intercept is

a. -1
b. 1
c. 3
d. $2e$
e. $1+2e$

8. Compute the derivative of $f(x) = (x^2+1)^x$.

a. $x(x^2+1)^{x-1}$
b. $x(x^2+1)^{x-1}2x$
c. $(x^2+1)^x \ln(x^2+1)$
d. $(x^2+1)^x \ln(x^2+1)2x$
e. $(x^2+1)^x \left[\ln(x^2+1) + \dfrac{2x^2}{(x^2+1)} \right]$

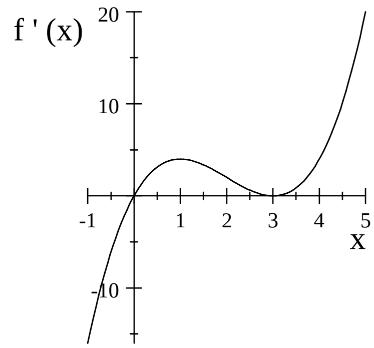
9. Find the locations of the absolute maximum and absolute minimum of $f(x) = x^3 - 5x^2 - 8x$ on the interval $[0, 5]$.

a. Abs Min at $x = 5$ Abs Max at $x = 0$
b. Abs Min at $x = 4$ Abs Max at $x = 0$
c. Abs Min at $x = 0$ Abs Max at $x = 5$
d. Abs Min at $x = 4$ Abs Max at $x = -\dfrac{2}{3}$
e. Abs Min at $x = 4$ Abs Max at $x = 5$

10. For $f(x) = 3\sin(x) - x^3 - 3x$ which of the following is TRUE?

a. The First Derivative Test says $x = 0$ is a Local Maximum
b. The Second Derivative Test says $x = 0$ is a Local Minimum
c. The Second Derivative Test says $x = 0$ is a Local Maximum
d. The Second Derivative Test says $x = 0$ is an Inflection Point
e. The Second Derivative Test Fails at $x = 0$.

11. The plot at the right shows the graph of the FIRST DERIVATIVE $f'(x)$ of a function $f(x)$. Which of the following is FALSE?



a. $f(x)$ has a local maximum at $x = 0$

b. $f(x)$ is increasing on $(0, 1)$

c. $f(x)$ is increasing on $(1, 3)$

d. $f(x)$ has an inflection point at $x = 3$

e. $f(x)$ is concave up on $(-1, 1)$

12. Compute $\lim_{x \to 0} \frac{e^x - 1 - x}{x^2}$

a. $-\infty$

b. $\frac{-1}{2}$

c. 0

d. $\frac{1}{2}$

e. $+\infty$

13. Compute $\sum_{i=2}^{5} (2 + i^2)$.

a. 56

b. 58

c. 60

d. 62

e. 64

Part 2 – Work Out Problems (5 questions. Points indicated. No Calculators)

Solve each problem in the space provided. Show all your work neatly and concisely, and indicate your final answer clearly. You will be graded, not merely on the final answer, but also on the quality and correctness of the work leading up to it.

14. (6 points) Find the values of a and b so that $f(x) = ax^2 + b\ln(x)$ will have an inflection point at $(1, 5)$.

15. (8 points) Compute $L = \lim_{x\to\infty}\left(\left(1 + \frac{4}{x} + \frac{3}{x^2}\right)^x\right)$

16. (10 points) A paint can needs to hold a liter of paint (1000 cm^3). The shape will be a cylinder of radius r and height h. The sides and bottom will be made from aluminum which costs $\$0.20$ per cm^2. The top will be made from plastic which costs $\$0.05$ per cm^2. What are the DIMENSIONS and COST of the cheapest such can? (Keep answers in terms of π.)

17. (8 points) Derive the formula $\frac{d}{dx} \arcsin(x) = \frac{1}{\sqrt{1-x^2}}$.

Note: The inverse function of $\sin(x)$ is denoted by either $\arcsin(x)$ or by $\sin^{-1}(x)$.

18. (16 points) For the function $f(x) = xe^x$ find

a. all intervals where f is increasing or decreasing.

b. all intervals where f is concave up or concave down.

c. all local minima, local maxima, absolute minima and absolute maxima (give location and value).

d. all horizontal asymptotes (be sure to compute the limits).

Name (print): ______________________ Section No: ______

Question	Points/Max
1-13	/52
14	/ 6
15	/ 8
16	/10
17	/ 8
18	/16
Total	/100