NAME:________________________________ Section: 01 (9:30am), 02 (10:30), 03 (11:30)

MATH 2900
Fall 2008

Exam 2A

Instructions: You have 60 minutes to complete your exam. The exam is closed book/notes and calculators are not allowed. You must show all work and reasoning on the paper provided for full credit. Please work in a clean, ordered and **honorable** fashion. Put your final answers in the in the space provided.

Good Luck.

Problem	Points
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
Total	

1. (10pts) True or False.

(a) ____ If $f(x)$ is continuous on a closed interval $[a, b]$, then $f(x)$ obtains an absolute maximum and an absolute minimum in that interval.

(b) ____ If $x = c$ is a critical point of the function $f(x)$, then $f(c)$ must be either a relative maximum or a relative minimum.

(c) ____ If $f'(c) = 0$ and $f''(c) < 0$, then $f(c)$ is relative minimum.

(d) ____ The Chain Rule allows one to differentiate compositions of functions.

(e) ____ If $p(x) = x^{37} - 7x^{23} + 5x^{11} - 3x^8 - x^2 + 8$, then $p^{(38)}(x) = 0$.

2. (7pts) Find $\frac{dy}{dx}$ given that $y = x^2 \tan x$.

A. $\frac{dy}{dx} = 2x \cot x$

B. $\frac{dy}{dx} = 2x \sec^2 x$

C. $\frac{dy}{dx} = (2x \tan x)(x^2 \sec^2 x)$

D. $\frac{dy}{dx} = 2x \tan x + x^2 \sec^2 x$

E. $\frac{dy}{dx} = 2x \cot x + x^2 \tan x \sec x$

3. (7pts) Find $f'(t)$ given that $f(t) = \dfrac{5t}{t^2 - 5t - 3}$.

A. $f(t) = \dfrac{5(3t^2 - 10t - 3)}{(t^2 - 5t - 3)^2}$

B. $f(t) = \dfrac{-5t^2}{(t^2 - 5t - 3)^2}$

C. $f(t) = \dfrac{5}{2t - 5}$

D. $f(t) = \dfrac{-5(t^2 + 3)}{(t^2 - 5t - 3)^2}$

E. $f(t) = \dfrac{5(t^2 + 3)}{(t^2 - 5t - 3)^2}$

4. (7pts) Find y' given that $y = \sqrt[3]{4x^2 - x}$.

A. $y' = \dfrac{1}{3(4x^2 - x)^{2/3}}$

B. $y' = \dfrac{1}{3(8x - 1)^{2/3}}$

C. $y' = \dfrac{8x - 1}{3(4x^2 - x)^{2/3}}$

D. $y' = \dfrac{8x - 1}{3(4x^2 - x)^{1/3}}$

E. $y' = \dfrac{1}{3}(4x^2 - x)^{1/3}$

5. (7pts) Find $\frac{dy}{dx}$ given that $y = u(u-1)$ and $u = x^2 + x$.

A. $\frac{dy}{dx} = 2x^2 + 4x$

B. $\frac{dy}{dx} = 4x^3 + 6x^2 - 1$

C. $\frac{dy}{dx} = 4x^3 + 6x^2 - 2x$

D. $\frac{dy}{dx} = 2x^2 + 4x + 1$

E. $\frac{dy}{dx} = 4x^4 + 6x^3 - 2x + 1$

6. (7pts) Find an equation for the tangent line to curve $y = \sec(x/4)$ at $x = \pi$.

A. $y - \sqrt{2} = \frac{\sqrt{2}}{4}(x - \pi)$

B. $y - \pi = \frac{\sqrt{2}}{4}(x - \sqrt{2})$

C. $y - \sqrt{2} = \sqrt{2}(x - \pi)$

D. $y - \frac{\sqrt{2}}{2} = 2\sqrt{2}(x - \pi)$

E. $y - \frac{1}{2} = \sqrt{2}(x - \pi)$

7. (7pts) The number of bacteria present in a culture at time t, in hours, is $N(t) = 3t(t-10)^2+40$. Find the rate at which the bacteria population is changing after 8 hours.

   A. decreasing by 96 bacterium per hour

   B. decreasing by 44 bacterium per hour

   C. increasing by 136 bacterium per hour

   D. decreasing by 84 bacterium per hour

   E. increasing by 12 bacterium per hour

8. (7pts) Find the relative extrema for the function $f(x) = 3x^5 - 5x^3$, if they exist.

   A. (0,0), (-1,2), (1,-2)

   B. (-1,0), (1,0)

   C. (0,0), (-1,2)

   D. (0,0), (-1,0), (1,0)

   E. (-1,2), (1,-2)

9. (7pts) $S(x) = -x^3 + 6x^2 + 288x + 4000, \quad 4 \leq x \leq 20$ is an approximation to the number of salmon swimming upstream to spawn, where x represents the water temperature in degrees Celsius. Find the temperature that produces the maximum number of salmon.

A. 12°C

B. 20°C

C. 4°C

D. 8°C

E. -8°C

10. (7pts) Find the points of inflection for the function $f(x) = x^4 - 4x^3 + 8$, if they exist.

A. (0,8), (3,-19)

B. (0,8), (2,-8)

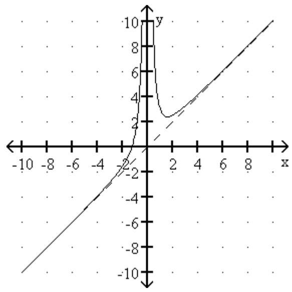
C. (0,0), (-1,2)

D. (0,0), (2,-16)

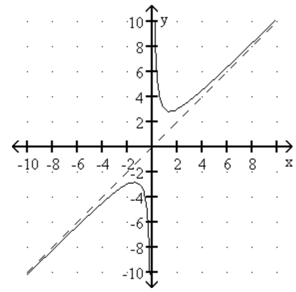
E. (3,-19)

11. (7pts) Sketch the graph of the function $f(x) = x + \dfrac{2}{x}$.

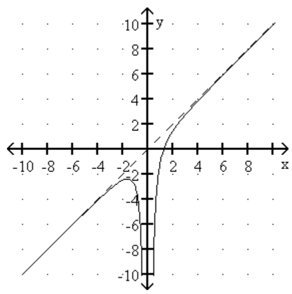
A.



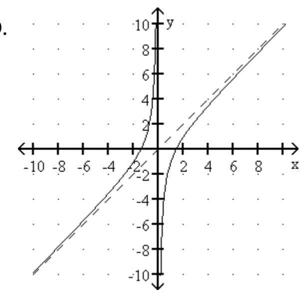
B.



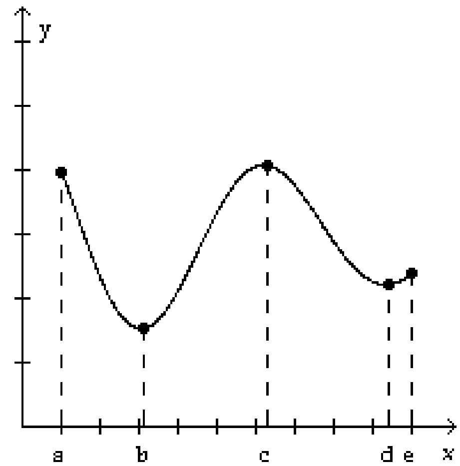
C.



D.



12. (7pts) Using the graph below and the intervals noted, explain how the first derivative of the depicted function indicates whether the function is increasing or decreasing.



A. The first derivative is positive on the intervals (a, b) and (c, d), which indicates that the function is increasing on these intervals. The first derivative is negative on the intervals (b, c) and (d, e), which indicates that the function is decreasing on these intervals.

B. The first derivative is positive on the intervals (a, b) and (c, d), which indicates that the function is decreasing on these intervals. The first derivative is negative on the intervals (b, c) and (d, e), which indicates that the function is increasing on these intervals.

C. The first derivative is negative on the intervals (a, b) and (c, d), which indicates that the function is increasing on these intervals. The first derivative is positive on the intervals (b, c) and (d, e), which indicates that the function is decreasing on these intervals.

D. The first derivative is negative on the intervals (a, b) and (c, d), which indicates that the function is decreasing on these intervals. The first derivative is positive on the intervals (b, c) and (d, e), which indicates that the function is increasing on these intervals.

13. (7pts) Given the rational function $f(x) = \dfrac{x^2+x-2}{2x^2-2}$, determine its asymptotes.

A. Vertical asymptote: $x = 1$, $x = -1$; horizontal asymptote: $y = \dfrac{1}{2}$

B. Vertical asymptote: $x = 1$; horizontal asymptote: $y = \dfrac{1}{2}$

C. Vertical asymptote: $x = 1$, $x = -1$; horizontal asymptote: $y = 0$

D. Vertical asymptote: $x = 1$; horizontal asymptote: $y = 0$

E. Vertical asymptote: $x = 1$, $x = -1$; no horizontal asymptote

14. (7pts) Find the absolute maximum and absolute minimum of $f(x) = x^4 - 2x^3$ on the closed interval [-2,2].

A. Absolute maximum = 32, absolute minimum = 0

B. Absolute maximum = 32, absolute minimum = -27/16

C. No absolute maximum, absolute minimum = -27/16

D. Absolute maximum = 32, no absolute minimum

E. Absolute maximum = 0, absolute minimum = -27/16