

University of Saskatchewan
Department of Mathematics and Statistics
Midterm II Examination
May 29, 2006, Math 110.3, Instructor: Pawel Gladki, Time:60 minutes

Closed book. No calculators. No formula sheets.

Print your name clearly and write your student ID number on the opscan sheet. Encode your answers carefully on the opscan sheet. Use the provided examination booklets as a scrap paper only! Solutions in the examination booklets that are not copied onto the opscan sheet will NOT be graded!

Each question has equal mark. There is only one correct answer to each question. Total number of points: 15

1. Find the limit $\lim_{h \rightarrow 0} \frac{f(x+h)-f(x)}{h}$ if $f(x) = x^5$.
A) 0 B) x^4 C) $4x^4$ D) $4x^5$
E) $5x^4$ F) $5x^5$ G) x^5 H) **D.N.E.**
2. Find the limit $\lim_{x \rightarrow -\infty} \frac{\cos x}{x}$.
A) $-\infty$ B) ∞ C) 0 D) **D.N.E.** E) -1 F) 1 G) $-\frac{1}{2}$ H) $\frac{1}{2}$
3. For which value of the constant c is the function f continuous on $(-\infty, \infty)$?

$$f(x) = \begin{cases} cx + 3, & \text{if } x \leq 0 \\ 2x^2 - x + c, & \text{if } x > 0. \end{cases}$$

- A) 3 B) -3 C) 0 D) 1 E) -1 F) 2 G) -2 H) $\sqrt{3}$
4. Find the limit $\lim_{x \rightarrow \infty} (x - \sqrt{x})$.
A) 0 B) **D.N.E.** C) ∞ D) $-\infty$ E) 1 F) -1
G) $\sqrt{2}$ H) $-\sqrt{2}$
 5. Which of the following lines are asymptotes of $f(x) = \frac{x^2-6x+8}{x^2-5x+6}$.
A) $x = 2$ and $x = 3$ B) $x = -2$ and $x = 3$
C) $x = 2$ and $y = 3$ D) $y = -2$ and $y = 3$
E) $x = 3$ and $y = 1$ F) $x = 3$ and $y = -1$
G) $x = 3$, $y = 1$ and $y = -1$ H) $x = 2$, $x = 3$, $y = 1$ and $y = -1$
 6. Find $f'(4)$ if $f(x) = \sqrt{x^2 + 9}$.
A) 0 B) 2 C) -2 D) $\frac{1}{10}$ E) $-\frac{1}{10}$ F) $\frac{4}{5}$ G) $-\frac{4}{5}$ H) $\frac{1}{3}$

7. Find $f'(1)$ if $f(x) = (x^4 - 3x^2 + 5)^2$.
 A) 5 B) -5 C) 6 D) -6 E) 11 F) -11 G) 12 H) -12
8. Find $f'(x)$ if $f(x) = (x^2 + e^x)(\sqrt{x} + \sin x)$.
 A) $(2x + e^x)(\sqrt{x} + \sin x) + (x^2 + e^x)(\frac{1}{2\sqrt{x}} + \cos x)$
 B) $(x^2 + e^x)(\sqrt{x} + \sin x) + (x^2 + e^x)(\frac{1}{2\sqrt{x}} + \cos x)$
 C) $(2x + e^x)(\sqrt{x} + \sin x) + (x^2 + e^x)(\frac{1}{2\sqrt{x}} - \cos x)$
 D) $(x^2 + e^x)(\sqrt{x} + \sin x) + (x^2 + e^x)(\frac{1}{2\sqrt{x}} - \cos x)$
 E) $(x^2 + e^x)(\sqrt{x} + \sin x) - (x^2 + e^x)(\frac{1}{2\sqrt{x}} - \cos x)$
 F) $(x^2 - e^x)(\sqrt{x} + \sin x) - (x^2 + e^x)(\frac{1}{2\sqrt{x}} - \cos x)$
 G) $(x^2 - e^x)(\sqrt{x} + \sin x) - (x^2 + e^x)(\frac{1}{2\sqrt{x}} - \sin x)$
 H) $(x^2 - e^x)(\sqrt{x} - \sin x) - (x^2 + e^x)(\frac{1}{2\sqrt{x}} - \sin x)$
9. Find $f'(x)$ if $f(x) = \csc x(x + \cot x)$.
 A) $\csc x \cot x(x + \cot x) + \csc x(1 - \csc^2 x)$
 B) $-\csc x \cot x(x + \cot x) + \csc x(1 - \csc^2 x)$
 C) $\sec x \cot x(x + \cot x) + \csc x(1 - \csc^2 x)$
 D) $-\sec x \cot x(x + \cot x) + \csc x(1 - \csc^2 x)$
 E) $\sec x \cot x(x + \cot x) + \csc x(1 + \csc^2 x)$
 F) $-\sec x \cot x(x + \cot x) + \csc x(1 + \csc^2 x)$
 G) $\sec x \cot x(x + \cot x) + \sec x(1 + \csc^2 x)$
 H) $-\sec x \cot x(x + \cot x) - \sec x(1 + \csc^2 x)$
10. Find $f'(x)$ if $f(x) = \frac{x^2+x+1}{x^2+3x+2}$.
 A) $\frac{2x^2-2x-1}{(x^2+3x+2)^2}$ B) $\frac{2x^2-2x+1}{(x^2+3x+2)^2}$ C) $\frac{2x^2+2x+1}{(x^2+3x+2)^2}$ D) $\frac{2x^2+2x-1}{(x^2+3x+2)^2}$
 E) $\frac{x^2+2x-2}{(x^2+3x+2)^2}$ F) $\frac{x^2-2x-2}{(x^2+3x+2)^2}$ G) $\frac{x^2-2x+2}{(x^2+3x+2)^2}$ H) $\frac{x^2+2x+2}{(x^2+3x+2)^2}$
11. Find $f'(x)$ if $f(x) = \frac{\tan x - 1}{\sec x}$.
 A) $\frac{\csc^3 x - (\tan x - 1) \csc x \tan x}{\sec^2 x}$ B) $\frac{\sec^3 x + (\tan x - 1) \sec x \tan x}{\sec^2 x}$
 C) $\frac{\csc^3 x + (\tan x - 1) \csc x \tan x}{\sec^2 x}$ D) $\frac{\sec^3 x - (\tan x - 1) \sec x \tan x}{\sec^2 x}$
 E) $\frac{\sec^3 x - (\tan x - 1) \sec x \cot x}{\sec^2 x}$ F) $\frac{\sec^3 x + (\tan x - 1) \sec x \cot x}{\sec^2 x}$
 G) $\frac{\sec^2 x \csc x - (\tan x - 1) \csc x \tan x}{\sec^2 x}$ H) $\frac{\sec^2 x \csc x - (\tan x - 1) \sec x \cot x}{\sec^2 x}$
12. Find $(\frac{f}{g})'(5)$ if $f(5) = 1$, $f'(5) = 6$, $g(5) = -3$ and $g'(5) = 2$.
 A) $\frac{2}{9}$ B) $-\frac{2}{9}$ C) $\frac{9}{2}$ D) $-\frac{9}{2}$ E) $\frac{20}{9}$ F) $-\frac{20}{9}$ G) $\frac{10}{4}$ H) $-\frac{10}{4}$
13. Find the limit $\lim_{x \rightarrow 0} \frac{x}{\sin 5x}$.
 A) 1 B) -1 C) 0 D) ∞ E) $-\infty$ F) $\frac{1}{5}$ G) $-\frac{1}{5}$ H) 5
14. Find an equation of the tangent line to $y = 2xe^x$ at the point $(0, 0)$.
 A) $y = 2x$ B) $y = -2x$ C) $y = \frac{1}{2}x$ D) $y = -\frac{1}{2}x$
 E) $y = x - 2$ F) $y - 2 = x$ G) $y = 0$ H) $x = 0$
15. A particle moves along a straight line with the equation of motion $s(t) = \frac{1}{3}t^3 - 2t^2 + 5t + 7$. When the velocity is equal to 1?
 A) 1 B) 2 C) 3 D) 4 E) 5 F) 6 G) 7 H) 8