

Exam 1
Chapter 1, 2 and 3.1-3.5
(without 3.4)

Multiple Choice

Answer the following multiple choice questions. Each question is worth 6 points. You may circle between 1 and 3 answers on each question. Circling 1 and getting the correct answer is worth 6 points. Circling 2 and getting the correct answer is worth 3 points. Circling 3 and getting the correct answer is worth 1 point.

1. The expression $\frac{1}{2\sqrt[5]{x^2}}$ can be simplified in which of the following ways?

- (a) $\frac{1}{2x^{-2/5}}$ (b) $(2x)^{-2/5}$
(c) $\frac{x^{-2/5}}{2}$ (d) $\frac{x^{2/5}}{2}$

2. Which of the following is the derivative of $\sin t \cos t$?

- (a) $\cos^2 t - \sin^2 t$ (b) $-\sin t \cos t$
(c) $\sin t \cos t$ (d) 1

3. Find $\lim_{x \rightarrow 1^+} \frac{1 - \sqrt{x}}{1 - x}$.

- (a) ∞ (b) $1/2$
(c) $-\infty$ (d) 0

4. On which interval does the equation $\tan x = x^2 - 1$ have a solution?

- (a) $(-\pi/2, -\pi/4]$ (b) $[-\pi/4, 0]$
(c) $[0, \pi/4]$ (d) $[\pi/4, \pi/2)$

5. Find $\lim_{t \rightarrow \infty} t \tan(8t)$.

- (a) ∞ (b) 0
(c) 4 (d) 8

6. Which of the following is the derivative of $\frac{\tan x}{\ln x}$?

- (a) $\frac{\tan x/x - \ln x \sec^2 x}{\ln(x)^2}$ (b) $\frac{\ln x \sec^2 x - \tan x/x}{\ln(x)^2}$
(c) $\frac{\tan x/x - \ln x \sec^2 x}{\ln(x^2)}$ (d) $\frac{\ln x \sec^2 x - \tan x/x}{\ln(x^2)}$

7. Find the point (or points) where the function $f(x) = x^3 + 6x^2 - 36x + 100$ has horizontal tangent lines.

- (a) $x = -2$ (b) there are no horizontal tangent lines
(c) $x = -6$ and $x = 2$ (d) $x = -2$ and $x = 2$

8. Suppose θ is an angle in the 3rd or 4th quadrant such that $\tan \theta = \sqrt{3}$. What is θ ?

- (a) $-\frac{\pi}{6}$ (b) $\frac{5\pi}{6}$
(c) $\frac{7\pi}{6}$ (d) $-\frac{2\pi}{3}$

Short Answer

Answer the following questions. *You must show your work to receive full credit.* Be sure to make reasonable simplifications. Indicate your final answer with a box.

1. (8 points) Find all asymptotes of the function $f(x) = \frac{2x^2-2}{5x^2-40x+35}$.

2. (4 points) Use any method to find $\lim_{h \rightarrow 0} \frac{e^{x+h} - e^x}{h}$. Give at least one sentence of explanation. (Yes! That means words.)

3. (10 points) Find $\frac{dy}{dx}$, where

$$y = x^{\pi+1} - 5e^x + \ln x + 6 \sin x - \frac{\cos x}{7}.$$

4. (10 points) Find the tangent line to the function $g(x) = 6 \cos(x)$ at the point $x = \pi/2$.

5. (10 points) For what values of a is the function

$$m(x) = \begin{cases} a^2x - 2a & x \geq 2 \\ 12x & x < 2 \end{cases}$$

continuous at every x ?

6. Consider the function $h(x) = \frac{x^3+3x^2-10x}{x^2-4}$.

(a) (5 points) For what values of x is h discontinuous?

(b) (5 points) Create the function H which is a continuous extension of h at all points where this is possible.

Bonus Question

1. (8 points) Use the $\epsilon - \delta$ definition of limits to show that $f(x) = x^2 - 2$ is continuous at $x = 3$.