

Name: _____

Use of books, notes or calculators is **NOT** permitted.

Please show all your work! Answers without appropriate supporting work may not receive full credit.

Clearly indicate your answers to each problem by underlining them or placing a box around your answers!

Trigonometric functions at the values $0, \pi/6, \pi/4, \pi/3, \pi/2$, etc must be evaluated!

T/F Questions are graded with NO PARTIAL CREDIT.

Exam Score

Problem	Score	Out of:
1		15
2		20
3		15
4		15
5		20
6		8
7		7
Total		100

1. [15] For the True/False questions below, clearly circle your answer.

T or F If f and g are functions, then $f \circ g = g \circ f$.

T or F If p is a polynomial then $\lim_{x \rightarrow a} p(x) = p(a)$.

T or F $\lim_{x \rightarrow 1} \frac{x^2+6x-7}{x^2+5x-6} = \frac{\lim_{x \rightarrow 1}(x^2+6x-7)}{\lim_{x \rightarrow 1}(x^2+5x-6)}$.

T or F A function can have two different horizontal asymptotes.

T or F If $f(1) = -3$ and $f(2) = 2$, then there exists a number c in $(1, 2)$ such that $f(c) = 0$.

2. [20] Compute the limits:

(a) [5 pts]

$$\lim_{x \rightarrow -1} \frac{x^2 + 3x + 2}{x + 2}$$

(b) [5 pts]

$$\lim_{x \rightarrow -2^+} \frac{x - 1}{x^2(x + 2)}$$

(c) [5 pts]

$$\lim_{t \rightarrow 0} \frac{\sqrt{t^2 + 4} - 2}{t^2}$$

(d) [5 pts]

$$\lim_{x \rightarrow \infty} \frac{3x^2 - x + 5}{x^3 + x - 1}$$

3. [15] Given the function $f(x) = \ln(x + 3)$.
- (a) [5 pts] State the domain and the range of f .

(b) [5 pts] Find f^{-1} , i.e. the inverse function of f .

(c) [2 pts] Plot f .

(d) [3 pts] Is f one-to-one? Justify your answer.

4. [15] Let us consider the parametric curve given by

$$x(\theta) = 4 \cos(\theta) \quad y(\theta) = 3 \sin(\theta) \quad \theta \in [0, 2\pi].$$

(a) [5 pts] Eliminate the parameter to find the Cartesian equation of the curve.

(b) [5 pts] Identify the curve.

(c) [5 pts] Graph the curve for $\theta \in [0, \pi]$. Identify the starting and the ending points and draw an arrow on the curve to show the direction of increasing θ .

5. [20] Use the give graph to answer the follwoing questions

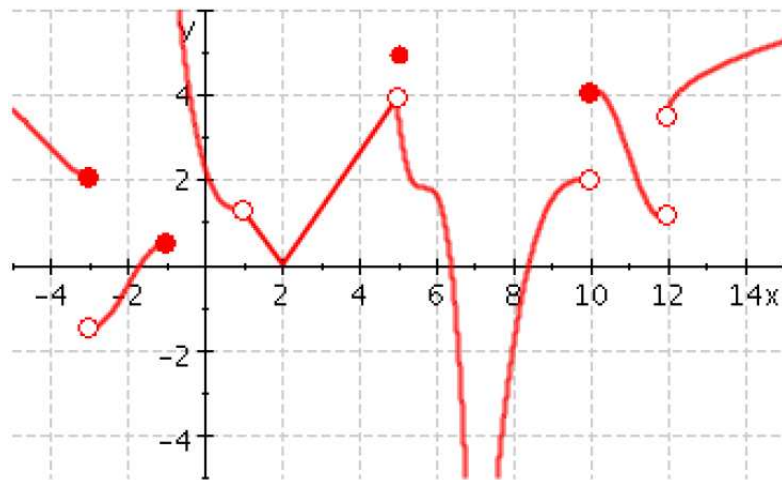


Figure 1: The graph of the function f

- (a) [8 pts] State all x values where f is discontinuous.
- (b) [7 pts] For each of the values stated in part a) determine whether f is continuous from the left, from the right or neither.
- (c) [5 pts] List all values of x where the limit does not exist (∞ , $-\infty$ or undefined).

6. [8] Find the equation of the tangent line to the graph of $y = \sqrt{x}$ at the point $(1, 1)$.

7. [7] Use the Squeeze theorem to compute

$$\lim_{x \rightarrow 0} \sqrt{x^4 + x^2} \cos\left(\frac{\pi}{x}\right).$$