Exam 1
Form A

Name: _____　　Section and/or TA: _____

Do not remove this answer page — you will return the whole exam. You will be allowed two hours to complete this test. No books or notes may be used. You may use a graphing calculator during the exam, but NO calculator with a Computer Algebra System (CAS) or a QWERTY keyboard is permitted. Absolutely no cell phone use during the exam is allowed.

The exam consists of 12 multiple choice questions and 4 free response questions. Record your answers to the multiple choice questions on this page by filling in the circle corresponding to the correct answer.

Show all work to receive full credit on the free response problems.

Multiple Choice Questions

1	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ					**7**	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ			
2	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ					**8**	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ			
3	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ					**9**	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ			
4	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ					**10**	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ			
5	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ					**11**	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ			
6	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ					**12**	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ			

SCORE

Multiple Choice	13	14	15	16	Total Score
60	10	10	10	10	100

Trigonometric Identities

$$\sin^2(x) + \cos^2(x) = 1$$

$$\sin(x + y) = \sin(x)\cos(y) + \cos(x)\sin(y)$$

$$\cos(x + y) = \cos(x)\cos(y) - \sin(x)\sin(y)$$

$$\sin(2x) = 2\sin(x)\cos(x)$$

$$\cos(2x) = \cos^2(x) - \sin^2(x)$$

Multiple Choice Questions

1. Find $\lim\limits_{x \to -\infty} \dfrac{12x^5 + 13x^4 - 14x}{12x^4 - 31x^2 + 12}$.

     A.   1

     B.   12

     C. $-11/7$

     D. ∞

     E. $-\infty$

2. Find $\lim\limits_{x \to -\infty} \dfrac{x + |x|}{x + 1}$.

     A.   0

     B.   1

     C.   2

     D. -2

     E. $-\infty$

3. Find the inverse function of $f(x) = \dfrac{2x+1}{3x+2}$.

    A. $\dfrac{3x+2}{2x+1}$

    B. $\dfrac{\frac{1}{2}x+1}{\frac{1}{3}x+\frac{1}{2}}$

    C. $\dfrac{2x}{2-3x}$

    D. $\dfrac{2x-1}{2-3x}$

    E. $\dfrac{2x-1}{3x-2}$

4. Evaluate the limit
$$\lim_{x \to 1} \left(x^3 + 4\right)^2 \left(x^2 + 9\right)$$

    A. 25

    B. 50

    C. 250

    D. 500

    E. 2500

5. Given that $\lim_{x \to a} f(x) = -3$, $\lim_{x \to a} g(x) = -4$, and $\lim_{x \to a} h(x) = 2$, find

$$\lim_{x \to a} \left((3h(x))^2 - 2f(x)g(x) \right).$$

    A. -12

    B.   12

    C.   36

    D.   43

    E.   60

6. If $2x + 2 \le f(x) \le x^2 + 2x + 2$, for all x, find $\lim_{x \to 0} f(x)$.

    A. 2

    B. 4

    C. 5

    D. 10

    E. Does not exist

7. By the Intermediate Value Theorem the equation $x^3 + 5x - 10 = 0$ has a root in which interval?

      A. $[-1,0]$

      B. $[0,1]$

      C. $[1,2]$

      D. $[2,3]$

      E. $[3,4]$

8. Find the equation of the line passing through the points $(-1,2)$ and $(3,10)$.

      A. $y = 2x - 2$

      B. $y = 2x + 4$

      C. $y = 2x - 10$

      D. $y = \frac{1}{2}x - \frac{3}{2}$

      E. $y = \frac{1}{2}x + \frac{5}{2}$

9. Find $\arcsin\left(\sin\left(\dfrac{7\pi}{6}\right)\right)$.

    A. $\dfrac{7\pi}{6}$

    B. $-\dfrac{\pi}{6}$

    C. $\dfrac{\pi}{6}$

    D. $\dfrac{5\pi}{6}$

    E. $-\dfrac{5\pi}{6}$

10. Find the horizontal asymptote(s) for $f(x) = \dfrac{\sqrt{4x^2+7}}{8x+6}$.

    A. $y = \frac{1}{4}$

    B. $y = \frac{1}{2}$

    C. $y = -\frac{1}{2}$ and $y = \frac{1}{2}$

    D. $y = -\frac{1}{4}$ and $y = \frac{1}{4}$

    E. The function has no horizontal asymptotes.

11. Find $\displaystyle\lim_{x\to-1}\frac{2x^2+3x+1}{x^2-2x-3}$

     A. $-\dfrac{3}{4}$

     B. $-\dfrac{1}{4}$

     C. $\dfrac{1}{4}$

     D. $\dfrac{1}{2}$

     E. $\dfrac{3}{4}$

12. A stone is tossed in the air from ground level. Its height at time t is $h(t) = 45t - 4.9t^2$ meters. Compute the average velocity of the stone over the time interval $[1.5, 3.5]$.

     A. 41 m/s

     B. 30.3 m/s

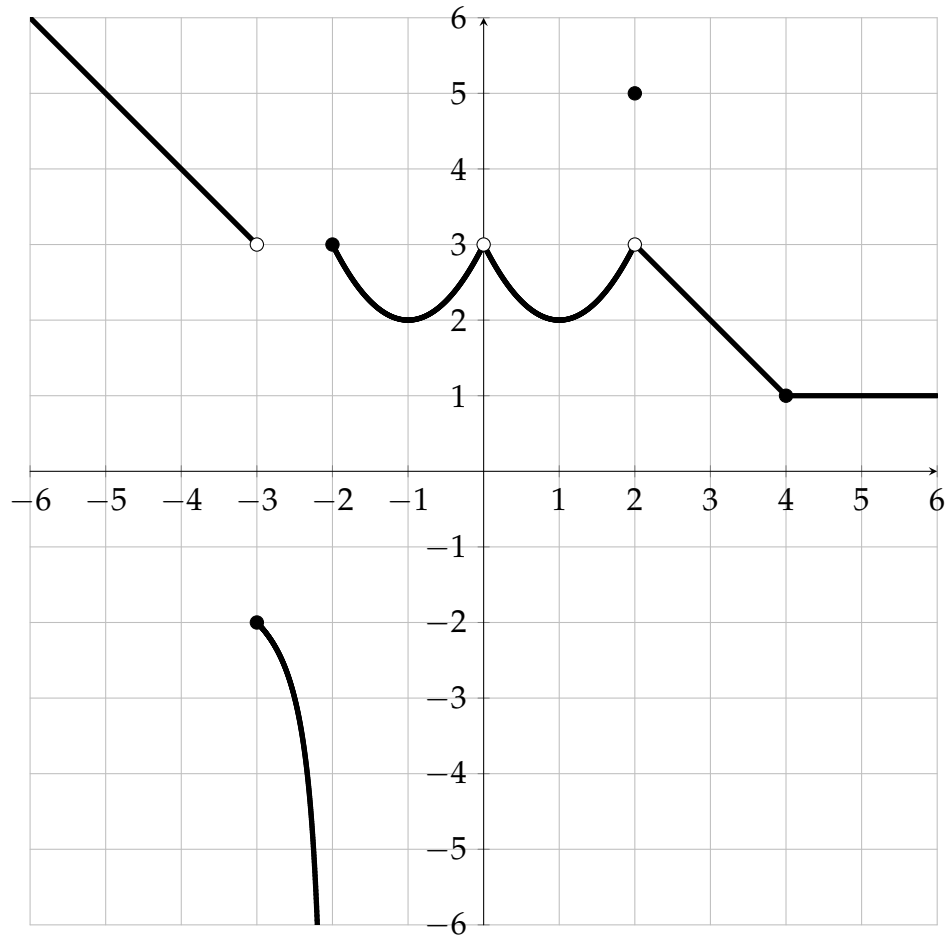   C. 20.5 m/s

     D. 10.7 m/s

     E. None of the above

Free Response Questions

13. (a) What does it mean for a function $f(x)$ to be continuous at a point $x = a$? Use complete sentences.

    (b) Consider the piecewise defined function

    $$f(x) = \begin{cases} 5 & \text{if } 0 \le x < 1 \\ ax + 3 & \text{if } 1 < x \le 2 \\ x^2 - 2x + b & \text{if } 2 \le x \le 3 \end{cases}$$

    where a and b are constants. Find the values of a and b for which $f(x)$ is continuous on $[0,3]$.

14. The graph of $f(x)$ is shown above. Find the following limits if they exist.

(a) $\displaystyle \lim_{x \to -3^+} f(x)$

(b) $\displaystyle \lim_{x \to -2^+} f(x)$

(c) $\displaystyle \lim_{x \to 2} f(x)$

(d) $\displaystyle \lim_{x \to 0} f(x)$

(e) What are the x-values at which $f(x)$ is not continuous on $[-6, 6]$.

15. Find the limits or state that the limit does not exist. In each case, show your work.

(a) $\displaystyle\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$

(b) $\displaystyle\lim_{x \to 1} \frac{x^3 - x}{x - 1}$

(c) $\displaystyle\lim_{x \to 5} 3x - 4 + \frac{2x + 4}{x - 3}$

(d) $\displaystyle\lim_{x \to \frac{\pi}{2}} 3\sin(2x) - 4e^{2\cos x}$

16. Find the limits or state that the limit does not exist. In each case, justify your answer.

(a) $\displaystyle\lim_{x\to+\infty} \frac{(2x^2+1)^2}{(x-1)^2(x^2+x)}$

(b) $\displaystyle\lim_{x\to-\infty} \frac{\sqrt{1+4x^6}}{2-x^3}$

(c) $\displaystyle\lim_{x\to+\infty} \frac{x-3x^2+x^4}{x^3-x+2}$

(d) $\displaystyle\lim_{x\to+\infty} e^{-2x}\cos x$