Exam 4

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 10 multiple choice questions and 10 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. The wise student will show work for the multiple choice problems as well.

Multiple Choice Questions

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

SCORE

Multiple Choice	11	12	13	14	15	16	17	18	19	20	Total Score
50	5	5	5	5	5	5	5	5	5	5	100

THIS PAGE SHOULD BE BLANK

Multiple Choice Questions

1. Expand $\sin(A - B)$

   A. $\sin B \cos A - \sin A \cos B$

   B. $\sin A \cos B - \sin B \cos A$

   C. $\cos A \cos B - \sin A \sin B$

   D. $\cos A \cos B + \sin A \sin B$

   E. $\sin A \cos B + \sin B \cos A$

2. Given that $\cos x = \frac{8}{17}$ find $\sin 2x$ and $\cos 2x$

   A. $\sin 2x = \frac{161}{289}, \cos 2x = -\frac{240}{289}$

   B. $\sin 2x = \frac{240}{289}, \cos 2x = \frac{161}{289}$

   C. $\sin 2x = -\frac{240}{289}, \cos 2x = -\frac{161}{289}$

   D. $\sin 2x = \frac{240}{289}, \cos 2x = \frac{161}{289}$

   E. $\sin 2x = \frac{240}{289}, \cos 2x = -\frac{161}{289}$

3. Find an equation for the line that passes through the point $(7, 1)$ and is perpendicular to the line $x - 3y + 25 = 0$.

   A. $y = 22 - 3x$

   B. $y = -\frac{1}{3}x - \frac{10}{3}$

   C. $y = 3x - 20$

   D. $y = x + 7$

   E. $y = \frac{1}{7}x - 22$

4. Solve the logarithmic equation for x: $\log_3(x + 4) - \log_3(x - 4) = 3$

   A. 4.31

   B. 14

   C. 0.23

   D. 5

   E. 6.56

5. Solve the equation $2^{2x} - 5 \cdot 2^x + 4 = 0$.

   A. $\{-1, -7\}$

   B. $\{1\}$

   C. $\{0.42\}$

   D. $\{0, 2\}$

   E. No solution

6. Use the Laws of Logarithms to expand the expression

$$\log\left(\frac{a^6}{b^3\sqrt{c}}\right).$$

   A. $6\log a - \log b - \frac{1}{2}\log c$

   B. $6\log a - 3\log b - \log\frac{c}{2}$

   C. $6\log a - 3\log b - \frac{1}{2}\log c$

   D. $\log(6a) - 3\log b - \frac{1}{2}\log c$

   E. $6\log a - 3\log b + \frac{1}{2}\log c$

7. Determine if $x = 2$ is a root of the equation $x^4 - 5x^2 + 4$. If so, find all other roots of the equation.

   A. Yes, $\{2, 1\}$

   B. Yes, $\{-1, 1\}$

   C. Yes, $\{-\sqrt{2}, \sqrt{2}\}$

   D. Yes, $\{-2, -1, 1\}$

   E. No, no other real roots.

8. Find the inverse function of $f(x) = \dfrac{9 - 4x}{4 - 2x}$.

   A. $f^{-1}(x) = \dfrac{4 - 2x}{9 - 4x}$

   B. $f^{-1}(x) = \dfrac{4x - 9}{2x - 4}$

   C. $f^{-1}(x) = \dfrac{4 - x}{2 - 4x}$

   D. $f^{-1}(x) = \dfrac{4x - 9}{2x + 4}$

   E. $f^{-1}(x) = \dfrac{4x + 9}{2x + 4}$

9. Find the intercepts and asymptotes of the function $f(x) = \dfrac{9x + 108}{-4x + 12}$.

A.	x-intercept $(-12, 0)$	y-intercept $(0, 9)$	horizontal asymptote $y = -2.25$	vertical asymptote $x = 3$
B.	x-intercept $(9, 0)$	y-intercept $(0, -12)$	horizontal asymptote $y = -2.25$	vertical asymptote $x = 3$
C.	x-intercept $(-12, 0)$	y-intercept $(0, 9)$	horizontal asymptote $y = 3$	vertical asymptote $x = -2.25$
D.	x-intercept $(-12, 0)$	y-intercept $(0, 9)$	horizontal asymptote $y = 4$	vertical asymptote $x = -2.25$
E.	x-intercept $(-12, 0)$	y-intercept $(0, 9)$	horizontal asymptote $y = 9$	vertical asymptote $x = -9$

10. For $f(x) = x^5 + 5$, $g(x) = x - 8$, and $h(x) = \sqrt{x}$, find $(f \circ g \circ h)(x) = f(g(h(x))$.

A. $(f \circ g \circ h)(x) = (x^5 + 5)(x - 8)\sqrt{x}$

B. $(f \circ g \circ h)(x) = \sqrt{x^5 - 3}$

C. $(f \circ g \circ h)(x) = \left(\sqrt{x} - 8\right)^5 + 5$

D. $(f \circ g \circ h)(x) = \left(\sqrt{x} - 3\right)^5$

E. $(f \circ g \circ h)(x) = x^5 + x - 3 + \sqrt{x}$

Free Response Questions

11. Find all solutions of $\sin 2x - \cos x = 0$ in the interval $[0, 2\pi)$.

12. Given that the terminal point for angle θ is $(20, -21)$, find

(a) $\sin\theta$

(b) $\cos\theta$

(c) $\tan\theta$

(d) $\cot\theta$

(e) $\sec\theta$

(f) $\csc\theta$

13. Solve the triangle ΔABC given that $c = 30$, $\angle A = 52^\circ$ and $\angle B = 70^\circ$.

(a) Find a

(b) Find b

(c) Find $\angle C$

14. Solve the triangle ΔABC given that $b = 15$, $c = 18$ and $\angle A = 108^\circ$.

(a) Find a

(b) Find $\angle B$

(c) Find $\angle C$

15. A triangular field has sides of length 22, 36, and 44 yards.

    (a) Find the area.

    (b) Find the largest angle in the triangle.

16. Let $f(x) = 2x^2 + ax + 18$.

    (a) If $a = 10$ how many solutions are there to the equation $f(x) = 0$. Find them if possible.

    (b) If $a = 12$ how many solutions are there to the equation $f(x) = 0$. Find them if possible.

    (c) If $a = 13$ how many solutions are there to the equation $f(x) = 0$. Find them if possible.

17. The arctic lynx population in Northern Canada is given by the function $L(t) = 6000 + 3500 \sin\left(\frac{\pi t}{5} + \frac{9\pi}{10}\right)$ where the time t is measured in years since the year 2000.

    (a) What is the largest number of lynx present in the region at any time?

    (b) How much time elapses between occurrences of the largest and smallest lynx population?

18. The motion of a projectile that is fired with an initial velocity of v_0 at an angle θ to the horizon at a height of h_0 above the ground is described by the parametric equations

$$x(t) = (v_0 \cos\theta)t$$
$$y(t) = -16t^2 + (v_0 \sin\theta)t + h_0$$

(a) Baseball A is hit with an initial velocity of 98 feet per second at an angle of 35° at a height of 3.5 feet.

i. How long until the ball hits the ground?

ii. How far did it travel?

(b) Baseball B is hit with an initial velocity of 118 feet per second at an angle of 30° at a height of 3 feet.

i. How long until the ball hits the ground?

ii. How far did it travel?

(c) Which ball traveled farther?

19. Given that $\cos A = \frac{60}{61}$ and $\sin B = \frac{8}{17}$, find:

(a) $\sin A$

(b) $\cos B$

(c) $\sin(A + B)$

(d) $\cos(A + B)$

(e) $\sin 2A$

20. Plot the following points in the attached grid. Label each point with the appropriate letter.

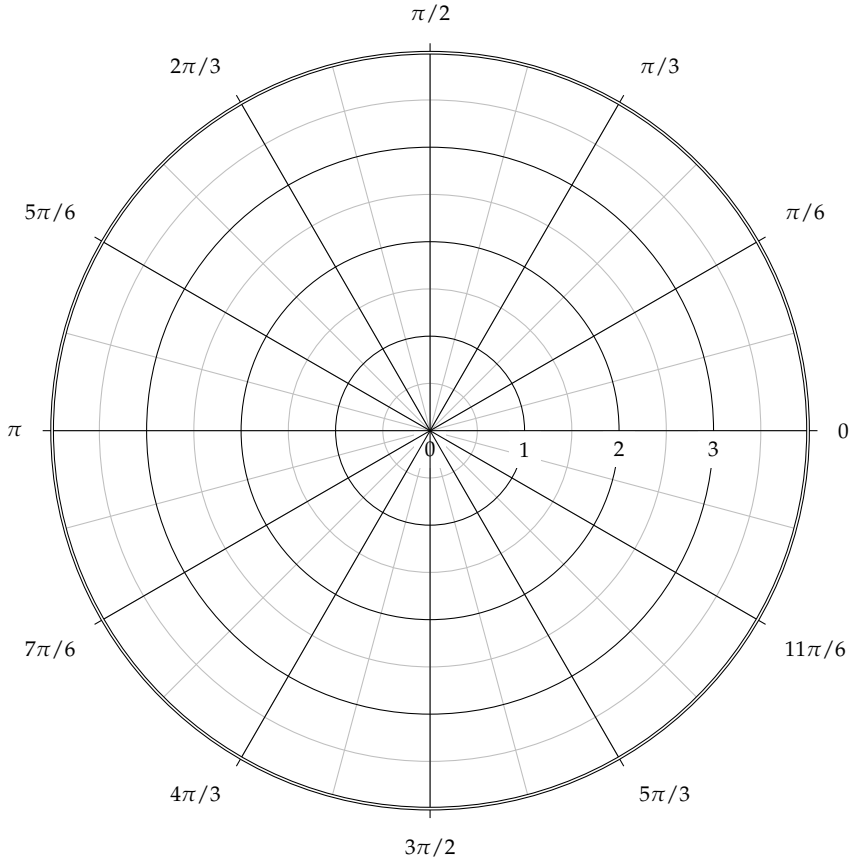
(a) the point with polar coordinates $\left(2, \frac{5\pi}{12}\right)$

(b) the point with polar coordinates $\left(-4, \frac{7\pi}{4}\right)$

(c) the point with polar coordinates $\left(1, \frac{\pi}{2}\right)$

(d) the point with ***rectangular coordinates*** $\left(\frac{3\sqrt{3}}{2}, \frac{3}{2}\right)$

(e) the point with ***rectangular coordinates*** $(-2, 0)$.



END OF TEST