

Final Exam
Mathematics 176
Section 3491 – Fall 2013
Professor Tim Busken

Name: _____

Show all your work. Answers without the proper explanation will receive no credit. Place your answers in the space provided. Calculators not allowed!

1. (5 points) Find all solutions of $\tan(\theta) = -\sqrt{3}$ 1. _____

2. (5 points) Find all solutions of $2 \cos^2(\theta) + 3 \cos(\theta) = -1$ 2. _____

3. (5 points) Find all solutions of $\log(x) + \log(x - 9) = 1$ 3. _____

4. (5 points) Find all solutions of $\ln(x) - \ln(x - 4) = \ln(3)$ 4. _____

5. (5 points) Find all solutions of $5^{4x-7} = 125$ 5. _____

6. (5 points) Use DeMoivre's Theorem to find $(1 - \sqrt{3}i)^3$
6. _____

7. (5 points) Find all solutions of $x^3 + 5x^2 - 2x - 10 = 0$ 7. _____

8. (5 points) Find the quotient and remainder of $\frac{x^4 + x^2 - 10x + 8}{x^2 - 3}$ using long division.

8. _____

Find the center, foci, and vertices of the ellipse then sketch the ellipse.

9. (5 points) $16x^2 + 25y^2 - 32x + 50y + 16 = 0$

9. _____

Find the standard form of the equation of the parabola with the given characteristic(s).

10. (4 points) Vertex: $(x, y) = (-3, 4)$; Focus: $(x, y) = (-3, 2)$

10. _____

11. (1 point) What equation represents the directrix of the parabola given in the previous question?

11. _____

Find the standard form of the equation of the hyperbola with the given characteristic(s).

12. (5 points) Vertices: $(1, 2)$, $(5, 2)$; Foci: $(0, 2)$, $(6, 2)$

12. _____

13. (5 points) Find the domain of $f(x) = \sqrt{3x - 5}$

13. _____

14. (5 points) Find the domain of $f(x) = \frac{2x}{3x - 5}$

14. _____

15. (5 points) Find the domain of $f(x) = \ln(2x - 1)$

15. _____

16. (5 points) Graph $f(x) = 1 - 2|x + 3|$. Label the important features.

17. (5 points) Graph $f(x) = \log(x + 3)$. Label the important features.

18. (5 points) Graph $r = 2 \sin(3\theta)$. Label the important features.

19. (5 points) Graph $f(x) = 2 \sin\left(x + \frac{\pi}{4}\right)$. Label the important features.

20. (5 points) Find the length and direction of the vector $\vec{u} = \langle -5, 5 \rangle$

20. _____

21. (5 points) Simplify $\csc\left(\sin^{-1}\left(\frac{\sqrt{2}}{2}\right)\right)$

21. _____

22. (5 points) Write the first three terms of the sequence $a_n = \frac{1}{5n - 2}$

22. _____

23. (5 points) Write an expression for the apparent n^{th} term (a_n) of the sequence.
(Assume that n begins with 1.)

$$\frac{2}{1}, \frac{-3}{3}, \frac{4}{5}, \frac{-5}{7}, \frac{6}{9}, \dots$$

23. _____

24. (5 points) Find the sum $\sum_{k=3}^5 (k + 1)^2$

24. _____

25. (5 points) Write the first four terms of the sequence defined recursively.

$$a_1 = 2, \quad a_{k+1} = 3a_k + 2$$

25. _____

26. (5 points) Write an expression for the n^{th} term (a_n) of the *arithmetic sequence* 7, 13, 19, 25, 31, ...

26. _____

27. (5 points) Find the matrix product, $A \cdot B$, assuming

$$A = \begin{bmatrix} 2 & -5 \\ -6 & 2 \end{bmatrix}, \quad B = \begin{bmatrix} -1 & 3 \\ 3 & -4 \end{bmatrix}$$

28. (4 points) Find the determinant of $A = \begin{bmatrix} 1 & -2 & -4 \\ 2 & -3 & -6 \\ -3 & 6 & 15 \end{bmatrix}$ if it exists.

28. _____

29. (1 point) Does the matrix A defined in the previous question have an inverse? Explain why or why not for full credit.

29. _____