Math 160 - Test #3 Info and Review Exercises

Fall 2018, Prof. Beydler

Test Info

- Date: Thursday, November 29, 2018
- Will cover packets #22 to #27.
- You'll have the entire class to finish the test.
- This will be a 2-part test. Part 1 will be **no calculator**. Part 2 will be **scientific calculator only**.
- No notes, no books, no phones during the test.
- As usual, there will be a seating chart for the test.
- Where to get help as you're studying:
  - Office hours
  - TMARC, LAC, or other tutoring centers
  - E-mail me at dbeydler@mtsac.edu

Review Exercises

Note: If you write up solutions to all of the review exercises listed below, and hand them in at the test, you can earn up to 2% extra credit towards your test! It is important to understand that these review exercises are not guaranteed to cover all of the potential problems on the test. Please review the notes, previous quizzes, and homework problems to fully prepare for the test.

Types of problems that will appear on Part 1 are labeled **NC** (for **N**o **C**alculator).

1. For each of the following trigonometric equations, first find all solutions (in radians). Then find all solutions (in radians) in the interval $[0, 2\pi)$.
   a) $2 - \sqrt{3}\cos x + 2\cos x = \sqrt{3} + 2\sin^2 x$

b) $\cos x = \csc^2 x \cos x$

c) $2 + 2\sin x = 3\cos^2 x$

d) $\sqrt{3}\tan x - 2\sec x = 1$

e) $\cos 2x + \cos x = 0$

f) $2\tan x \sin 4x - \sqrt{2}\tan x = 0$

g) $\sqrt{3}\tan\frac{x}{3} + 1 = 0$

2. Find the vector from the point $(4, 3)$ to the point $(5, -4)$. First, write the vector using component form. Then, write the vector in terms of $\vec{i}$ and $\vec{j}$. (**NC**)

3. Suppose $\vec{u} = \langle -2, -3 \rangle$ and $\vec{v} = \langle -1, 5 \rangle$.
   a) Find $\|\vec{v} + 2\vec{u}\|$.

   b) Find $-(2\vec{u} - \vec{v})$.

   c) Find the direction (in degrees) of $\vec{u}$ from the positive x-axis.

   d) Find a unit vector in the direction of $\vec{u}$.

   e) Find $\vec{u} \cdot \vec{v}$.

   f) Find the angle (in degrees) between $\vec{u}$ and $\vec{v}$.

g) Find the component of $\vec{u}$ along $\vec{v}$.

h) Find the projection of $\vec{u}$ onto $\vec{v}$.

i) Decompose $\vec{u}$ into $\overrightarrow{u_1}$ and $\overrightarrow{u_2}$, where $\overrightarrow{u_1}$ is parallel to $\vec{v}$ and $\overrightarrow{u_2}$ is orthogonal to $\vec{v}$.

4. Suppose $\vec{u} = \langle 5,\ 2\rangle$ and $\vec{v} = \langle 2, -1\rangle$. Decompose $\vec{u}$ into $\overrightarrow{u_1}$ and $\overrightarrow{u_2}$, where $\overrightarrow{u_1}$ is parallel to $\vec{v}$ and $\overrightarrow{u_2}$ is orthogonal to $\vec{v}$.

5. An airplane heads due west at 350 mi/h. It experiences a 30 mi/h crosswind blowing $N\ 20^\circ\ W$. (Round all values to 2 decimal places.)

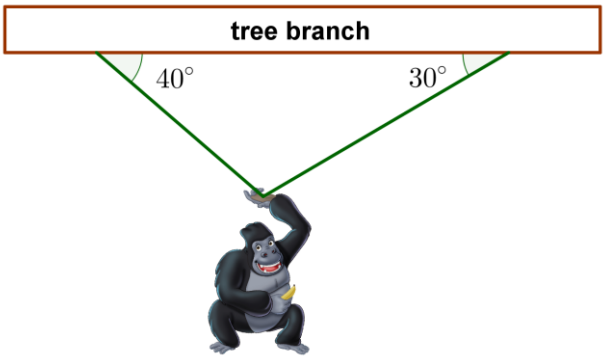
a) Find the velocity of the airplane relative to the ground.

b) What is the ground speed of the plane?

c) What is the plane's direction of movement relative to the ground?

6. A rowboat is being rowed 5 mi/h (relative to the water) across a straight river flowing west at 2 mi/h. In what direction should the rowboat be pointed in order to arrive at a landing point that's due north of it?

7. An 800-lb gorilla is hanging from two vines as shown below. Find the tension in each vine.



8. Are $\langle -5, 2 \rangle$ and $\langle 4, -10 \rangle$ orthogonal? (**NC**)

9. A giant 40-lb skateboard is on a slope that is inclined 10° to the horizontal. Find the magnitude of the force required to keep the skateboard from rolling down the hill. (Assume no friction on the slope.) Also, find the magnitude of the force experienced by the slope due to the weight of that heavy skateboard.

10. A 100-lb wagon is on a ramp. If a force of 20 lbs is just sufficient to keep the wagon from rolling down the ramp, find the angle of inclination of the ramp. (Assume no friction on the ramp.)

11. Determine whether the equation represents a parabola, an ellipse, or a hyperbola. If the graph is a parabola, find the vertex, focus, directrix, and focal diameter. If it is an ellipse, find the center, foci, vertices, lengths of the major and minor axes, and eccentricity. If it is a hyperbola, find the center, foci, vertices, and asymptotes. Then sketch the graph of the equation. (**NC**)
    a) $3y^2 + 12x = 0$

    b) $x^2 + 4x + 16 - 4y = 0$

c) $4x^2 + 3y^2 = 9$

d) $16x^2 + 9y^2 + 96x - 18y + 9 = 0$

e) $4y^2 = 5x^2 + 20$

f) $x^2 + 2x - 44 = 9y^2 - 36y$

12. Find an equation for the parabola that satisfies the given conditions. (**NC**)
    Vertex: $(-3, 1)$, focus: $(-2, 1)$

13. Find an equation for the ellipse that satisfies the given conditions. (**NC**)
    Foci $(2, -4)$ and $(2, 0)$, vertex: $(2, -5)$

14. Find an equation for the hyperbola that satisfies the given conditions. (**NC**)
    Vertices: $(0, \pm 5)$, asymptotes: $y = \pm \frac{3}{2}x$

15. Write the form of the partial fraction decomposition of $\frac{4x^5-3x^3+18x^2-17x+42}{(x+1)^3(x^2+x+1)(x^2+5)^2(7x-3)}$.

16. Find the partial fraction decomposition of $\frac{-7x^2+10x-7}{3x^3-4x^2-5x+2}$.

17. Find the partial fraction decomposition of $\frac{8x^3+19x^2+8x-4}{x^4+4x^3+4x^2}$.

18. Find the partial fraction decomposition of $\frac{4x^2+13x-3}{x^3-5x^2+2x-10}$.

19. Find the partial fraction decomposition of $\frac{-2x^4+5x^3-x^2+3x+3}{(x+1)(x^2+1)^2}$.

20. Find the partial fraction decomposition of $\frac{2x^4+9x^3+9x^2-6x-13}{x^2+4x+4}$.

21. Find all solutions to the system: $\begin{cases} -2x^2+5x+3y=6 \\ 2x+y-3=0 \end{cases}$ (**NC**)

22. Find all solutions to the system: $\begin{cases} x^2 - 3y^2 = 3 \\ x + 2y^2 = 1 \end{cases}$ (**NC**)