

NAME: _____

ALPHA: _____

PRECALCULUS (SM005)
FINAL EXAM – FALL 2016-2017
14 DEC 2016

Instructions:

1. You have three hours to complete this test.
 2. Fill out the Scantron form
 - a. Bubble in your Alpha Number
 - b. Bubble in Version 0 on the top line of the Version section
 - c. Write your name and section in the top right of the form
 3. Read each problem carefully. Ask questions if you do not understand the problem.
 4. Read through the exam first. Start with the easy problems. You may complete the exam in any order. However, calculators may only be used after turning in part I and part II.
 5. Record all Multiple Choice answers on the Scantron form.
 6. **SHOW ALL YOUR WORK** – partial credit will be awarded for correct work.
 7. **Calculators are NOT ALLOWED on part I or part II of this exam. Calculators are allowed on part III ONLY after turning in part I and part II. No graphing calculators are allowed.**
 8. Cell phones must be put away and are only allowed to be out in the event of an emergency.
 9. Part I is worth 50% (each problem is 2.5%). Part II is worth 18% (each problem is worth 1%). Part III is worth 32% (each problem is worth 4%).
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HONOR COMMITMENT

By signing below, I certify that:

1. the work that I will write in this exam represents my own work and my best understanding of the material; and
2. I will neither give assistance to another student nor receive assistance during this exam except that which comes from my instructor.

(signature)

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PART ONE: MULTIPLE CHOICE (50%)

Mark all of your answers on the Scantron Sheet – Calculator use is not allowed

1. Which of the following is an equation of a circle centered at $(2, -1)$ with the point $(5, 3)$ along its circumference?

- a. $(x - 2)^2 + (y + 1)^2 = \sqrt{5}$
 - b. $(x - 2)^2 + (y + 1)^2 = 5$
 - c. $(x - 2)^2 + (y + 1)^2 = 25$
 - d. $(2 + x)^2 + (-1 + y)^2 = \sqrt{5}$
 - e. $(2 + x)^2 + (-1 + y)^2 = 5$
-

2. Evaluate: $x = \log_3\left(\frac{1}{9}\right)$

- a. -3
 - b. -2
 - c. $\frac{1}{27}$
 - d. $\frac{1}{3}$
 - e. $\frac{1}{2}$
-

3. Which is the inverse of: $(x) = x^3 + 1$?

- a. $f^{-1}(x) = -x^3 - 1$
- b. $f^{-1}(x) = \frac{1}{x^3+1}$
- c. $f^{-1}(x) = \frac{1}{x^3} + 1$
- d. $f^{-1}(x) = -\frac{1}{x^3+1}$
- e. $f^{-1}(x) = \sqrt[3]{x-1}$

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4. If $(e^x)^4 = \frac{1}{2}$, solve for x :

a. $x = -\frac{1}{4}\ln(2)$

b. $x = \frac{1}{8}$

c. $x = -\ln\left(\frac{1}{2}\right)$

d. $x = \sqrt[4]{\frac{1}{2e}}$

e. None of the above

5. Which of the following is equal to: $\sqrt{2(50 + 4)}$?

a. $6\sqrt{3}$

b. $10\sqrt{6}$

c. $10\sqrt{8}$

d. $10 + 2\sqrt{2}$

e. 54

6. Which is the domain of the following function, $(x) = \frac{\sqrt{5-x}}{2+x}$?

a. $(-\infty, -2) \cup (-2, \infty)$

b. $(-\infty, -2) \cup (-2, 5]$

c. $(-\infty, -2) \cup (-2, 5) \cup (5, \infty)$

d. $[5, \infty)$

e. $(-\infty, \infty)$

7. Which of the following is a line through the point $(-1, 3)$ and perpendicular to: $-4x + 3y = 6$?

a. $y = -\frac{3}{4}x + 2$

b. $y = \frac{4}{3}x + 2$

c. $y = \frac{4}{3}x + \frac{13}{3}$

d. $y = -\frac{3}{4}x + \frac{9}{4}$

e. None of the above

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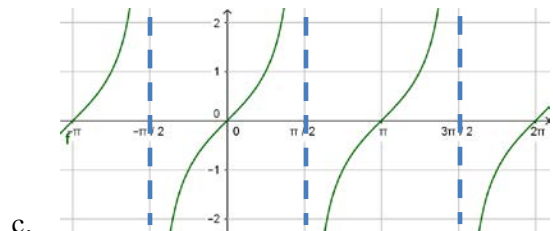
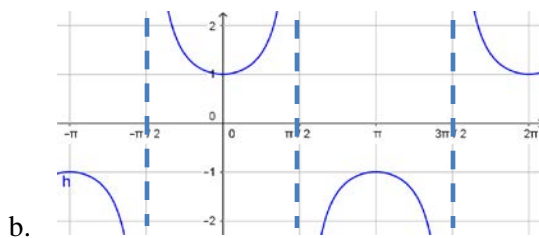
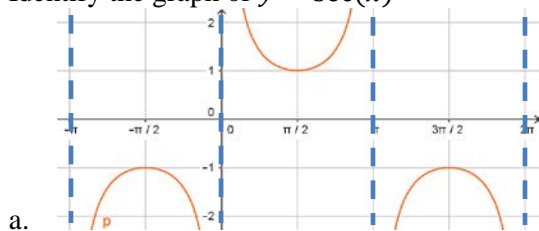
8. Solve the equation for x : $(3x - 3)^{1/2} - 8 = -5$

- a. 1
- b. 3
- c. 4
- d. 18
- e. none of the above

9. Solve the equation for x : $5^{(3-6x)} = \frac{1}{125}$

- a. -1
- b. $-\frac{1}{2}$
- c. 0
- d. $\frac{1}{2}$
- e. 1

10. Identify the graph of $y = \sec(x)$



- e. None of the above

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11. Write the following expression in condensed form:

$$2[\log(y - 1) - 4\log(y + 2)]$$

a. $\log[(y - 1)^2(y + 2)^4]$

b. $\log\left[\frac{(y-1)^2}{(y+2)^4}\right]$

c. $\log\left[\frac{(y-1)^2}{(y+2)^8}\right]$

d. $\log[(y - 1)^2(y + 2)^8]$

e. $\log\left[\frac{(y+2)^8}{(y-1)^2}\right]$

12. What is/are the x-intercept(s) of the following piecewise function?

$$y = f(x) = \begin{cases} -(x + 3), & x \leq 1 \\ x^2 - 1, & x > 1 \end{cases}$$

a. $(-3, 0)$

b. $(0, -3)$

c. $(0, -3)$ and $(0, -1)$

d. $(-1, 0)$, $(1, 0)$ and $(-3, 0)$

e. There is no x-intercept

13. Find the angle below that is co-terminal with $\theta = -\frac{13\pi}{6}$ (i.e. points in the same direction).

a. 30°

b. 150°

c. $\frac{11\pi}{6}$

d. $\frac{13\pi}{6}$

e. None of the above

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14. In the right triangle below, the side opposite angle θ , has a length of 2, and $\tan(\theta) = 2$, use the definitions of sine and tangent to evaluate $\sin(\tan^{-1}(2))$.

- a. $\frac{1}{\sqrt{5}}$
- b. $\sqrt{5}$
- c. 2
- d. $\frac{2}{\sqrt{5}}$
- e. $\frac{\sqrt{5}}{2}$



-
15. Given two functions, $f(x) = 2x^2 + 1$ and $g(x) = \frac{x}{3}$, which function represents $h(x) = (f \circ g)(x)$?

- a. $h(x) = \frac{2x^2}{9} + 1$
- b. $h(x) = \frac{2x^2}{3} + 1$
- c. $h(x) = \frac{2x^2+1}{3}$
- d. $h(x) = \frac{2x}{9} + 1$
- e. $h(x) = \frac{4x^2}{9} + 1$

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16. Evaluate the exponential function: $f(x) = -4^{-x}$, at $x = \frac{3}{2}$

- a. -8
- b. -1/8
- c. $-1/\sqrt[3]{16}$
- d. 1/8
- e. 8

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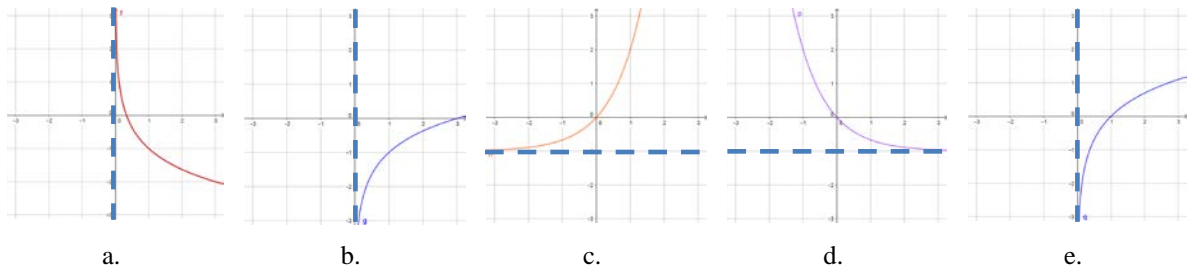
17. Evaluate: $\sin(-120^\circ)$

- a. $-\frac{\sqrt{3}}{2}$
- b. $-\frac{\sqrt{2}}{2}$
- c. $-\frac{1}{2}$
- d. 30°
- e. 60°

18. Which of the following is the simplification of $(3 - i)(1 + i - i^2)$?

- a. 6
- b. $7 + i$
- c. $4 - i$
- d. $3 - i^2 + i^3$
- e. $3 + 2i - 4i^2 + i^3$

19. Which graph represents $y = \log_{1/3}(x) - 1$?



20. Find the value of $\log_8(2) - \log_8(128)$.

- a. $-7/3$
- b. -2
- c. $1/3$
- d. $7/3$
- e. $5/2$

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PART II: SHORT ANSWER (18%)

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21. Write the equation, in slope intercept form, for the line through points (1,2) and (3,5).

22. Convert from degrees to radians: 120°

23. Add: $\frac{3}{4x+1} + \frac{2}{x}$

24. Simplify: $\frac{a^3(b^{-3}c)^2}{ab^2}$

25. Factor: $x^2 - x - 12$

26. Divide and simplify: $\frac{4}{7} \div \frac{2}{9}$

27. Find exactly: $\sin^{-1}\left(-\frac{1}{2}\right)$

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28. Solve for x in interval notation where: $8x \leq 2x + 24$

29. Find the distance between the points given by $(1, -3)$ and $(-2, -4)$

30. Evaluate $\tan^{-1}(0)$

31. Evaluate $\log_{36}(36)$

32. Evaluate $\sin^{-1}(1)$

33. Evaluate $(0.5)^{-1}$

34. Evaluate $1^{6/7}$

35. Evaluate $\sqrt{-54}$

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PART II: SHORT ANSWER (18%)

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36. Find the point of intersection (x,y) for the two lines below (i.e., solve the linear system).

$$5x + 3y = 2$$

$$5x - 3y = 8$$

$$(x, y) = (\underline{\hspace{2cm}}, \underline{\hspace{2cm}})$$

37. Given that $f(x) = \frac{1}{x}$ and $g(x) = x^2 - 2x - 3$, find $(fg)(x)$

38. Solve for x by condensing or expanding the following logs:

$$\log_2(x) - \log_2(x + 7) + \log_2((x + 7)^2) = 3$$

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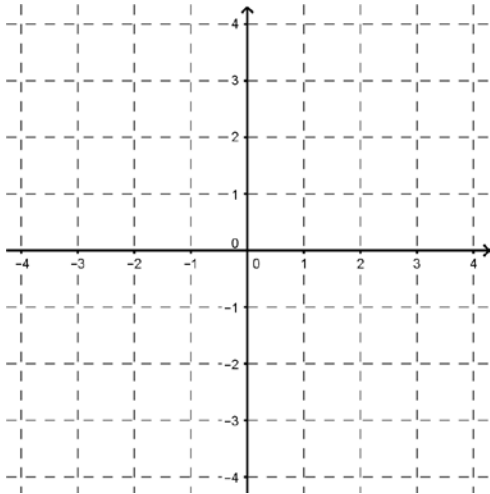
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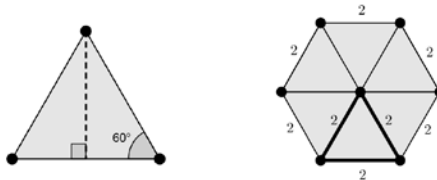
PART III: FREE RESPONSE (32%)

Write your answers in the space provided – Calculator use is allowed for this part only after turning in parts 1 and II

39. Accurately, sketch the graph of the function given by $f(x) = -x^2 + 1$. Include x - and y -intercept(s) and the vertex.



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40. A regular hexagon can be constructed from six equilateral triangles. The area of a triangle is $A = \frac{1}{2}bh$



If each side has a length of 2, calculate the area of the hexagon.

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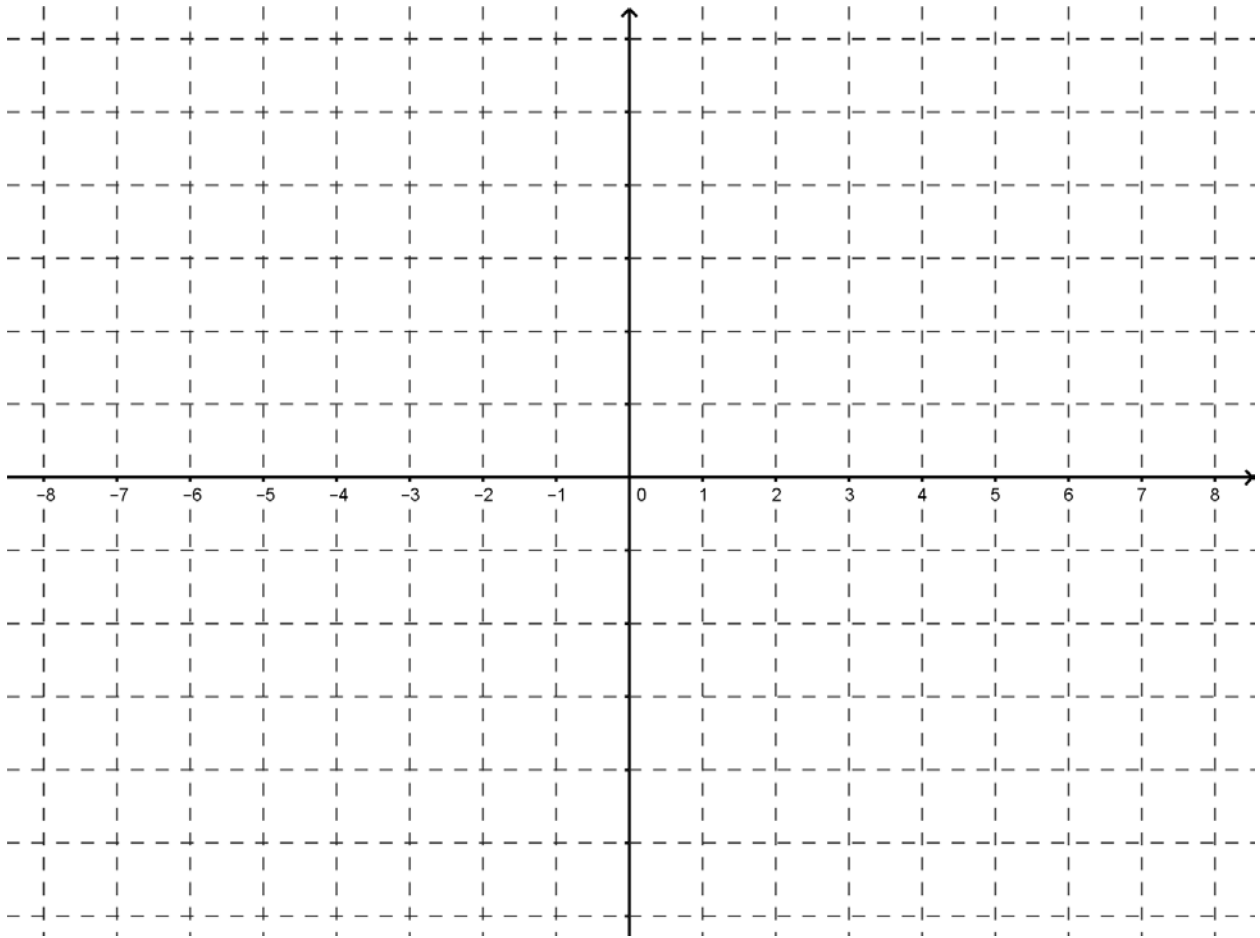
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41. Sketch a possible graph of the function, $y = 4(x + 2)^2(x - 3)$.

Points will be given for correct general shape to include: end behavior, correct axis intercepts, identifying any symmetry (y-axis, origin or neither), verifying the maximum number of turning points are not exceeded.

(Use of “test points” is not required, correct vertical scale is not required).



Left and right end behavior (you may use arrows): _____ (left) _____ (right)

x-intercept(s) coordinates: _____

y-intercept(s) coordinates: _____

symmetry (y-axis, origin or neither): _____

maximum number of turning points: _____

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42. Given the function $f(x) = \frac{x^2+8x+15}{x^2-25}$

a. Simplify the fraction by factoring

b. Simplify the fraction by long division.

c. Does this graph have asymptotes, holes, both, or neither? If asymptotes or holes exist, list them below.

(Sketch is not required, but may help you)

Horizontal asymptote(s): _____

Vertical asymptote(s): _____

Hole(s): _____

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PART III: FREE RESPONSE (32%)

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43. Given the following parabola,

$$y = f(x) = 2x^2 - 5x - 3$$

- a. Does this function intercept the x -axis? If so, give coordinates of any intercepts. If not, write “NO X-INTERCEPT”
- b. Does this function intercept the y -axis? If so, give coordinates of any intercepts. If not, write “NO Y-INTERCEPT”
- c. Find the vertex of the parabola. (Hint: complete the square) Is it a maximum or minimum value?

44. Given the continuously compounding exponential interest equation $A = Pe^{rt}$, where A is accumulated value, P is the principal or amount initially invested, r is the interest rate as a decimal (so 50% is written as 0.5) and t is time in years for compounding interest, how much time would it take to accumulate \$50,000 with an initial deposit of \$10,000 into an index fund that is expected to return 7% interest? Provide the number of years rounded to the nearest whole number.

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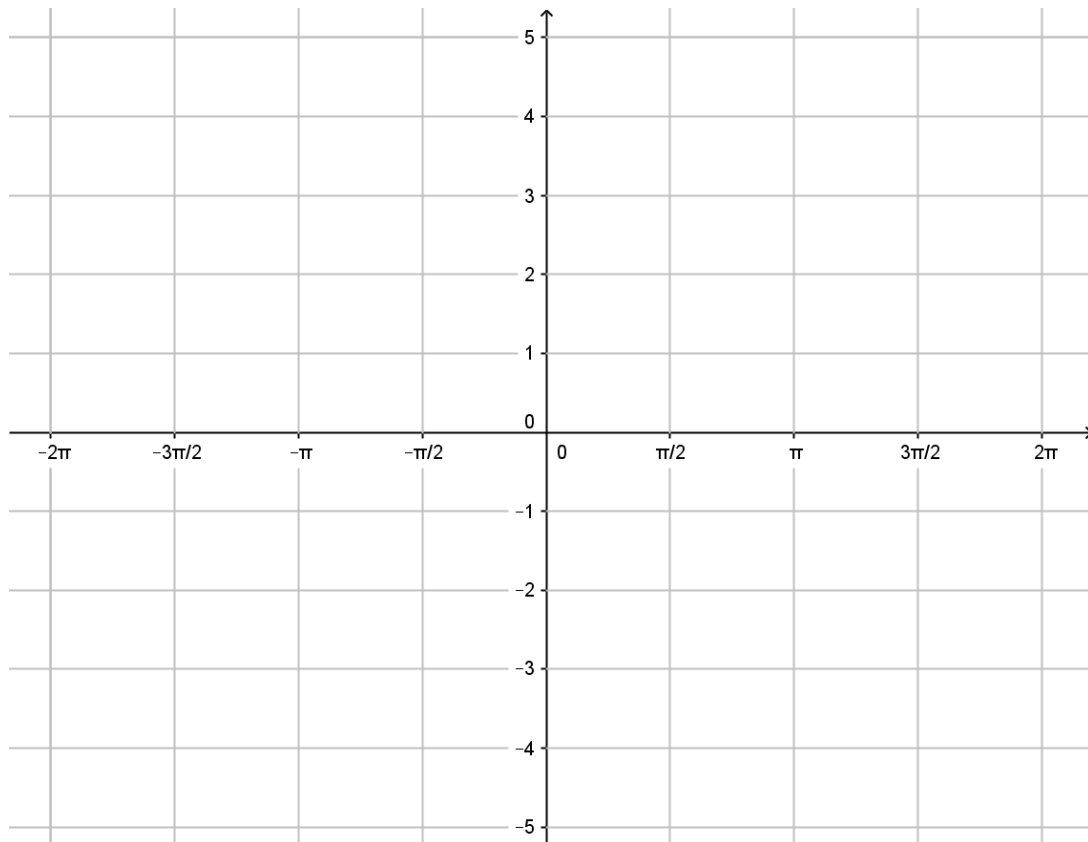
45. Given the function $y = f(x) = \frac{1}{2} \sin\left(x - \frac{\pi}{2}\right)$

- a. What are the domain and range of $f(x)$?

- b. What is the period of $f(x)$?

- c. What is the amplitude of $f(x)$?

- d. Sketch at least TWO periods of the graph of $f(x)$.



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46. Use the quadratic formula to solve $4x^2 + 3x + 1 = 0$. Include all solutions including complex numbers.