

Final Exam

College Algebra and Trigonometry
MTH 123, Section 6815, Spring 2012
Instructor: Abhijit Champanerkar & Jesenko Vukadinovic



Version A

Date: May 21st 2012

Points: 100

Time: 100 min

Name: _____

To receive full credit, you must explain your answers.

Each question is worth 10 points.

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

BEST OF LUCK

1. Circle the correct answer.

(a) The function $f(x) = \sin(x^2 + 1)$ is:

- (a) Odd function (b) Even function (c) Neither

(b) The function $f(x) = \sin x$ is one-to-one function on the interval $[0, 2\pi]$.

- (a) True (b) False (c) Neither

(c) For any functions $f(x)$ and $g(x)$, $f \circ g(x) = g \circ f(x)$.

- (a) True (b) False (c) Neither

(d) A quadratic function always has an absolute max/min on the interval $(-\infty, \infty)$.

- (a) True (b) False (c) Neither

(e) An exponential functions always has an absolute max/min on the interval $(-\infty, \infty)$.

- (a) True (b) False (c) Neither

(f) The function $f(x) = \sin 2x$ has an inverse on the interval $[0, 2\pi]$.

- (a) True (b) False (c) Neither

(g) Simplify $\sqrt[3]{(x^3y)^2y^4}$.

- (a) x^4y^2 (b) x^4y^4 (c) x^2y^4 (d) x^2y^2

(h) What is the average rate of change of $f(x) = 2x^2 - 3$ between $x = 2$ and $x = 3$?

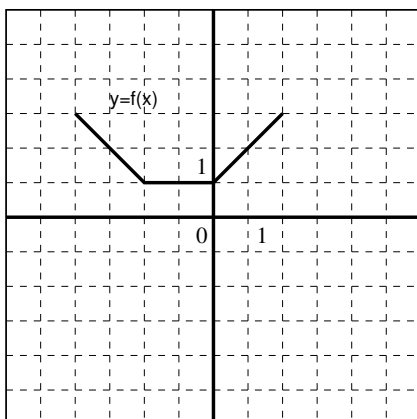
- (a) 12 (b) 10 (c) 15 (d) 20

- 2. (a)** Find the slope and equation of the line passing through points $(-1, 2)$ and $(2, -7)$. Write your final answer in the slope-intercept form $y = mx + b$.

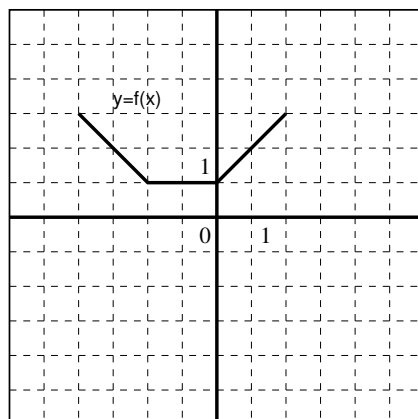
- (b)** Let $f(x) = 7 - 8x - 2x^2$. Put $f(x)$ in standard form $a(x - h)^2 + k$. Does $f(x)$ have a maximum or minimum ? Find it.

3. (a) The graph of $y = f(x)$ is as shown. Sketch the graphs of the following functions :

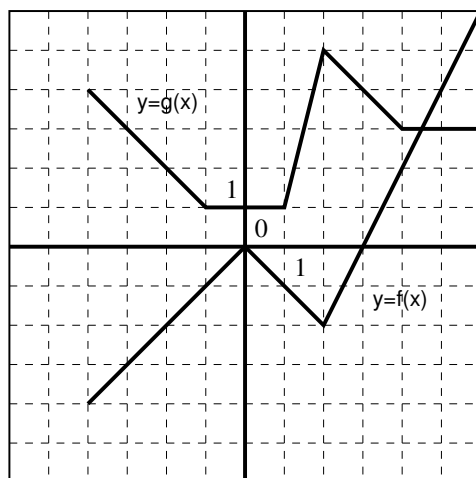
(1) $y = f(x) - 2$



(2) $y = f(x + 1)$



- (b) The graphs of $y = f(x)$ and $y = g(x)$ are given below.



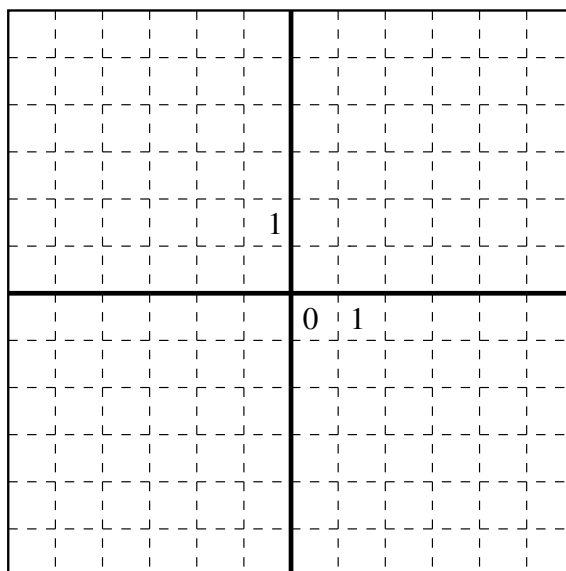
(i) $(f - g)(2) = \underline{\hspace{2cm}}$

(ii) $(g \circ f)(4) = \underline{\hspace{2cm}}$

(iii) $(f \circ g)(-2) = \underline{\hspace{2cm}}$

(iv) Intervals on which $f(x)$ is increasing $\underline{\hspace{2cm}}$

4. (a) Sketch the line $2x - 3y = 6$. Write down the x - & y -intercepts and the slope.



- (b) You want to fence off a rectangular plot of land adjacent to a river (with no fence along the river). Find the area of the largest plot possible with 400 ft of fencing. Please explain your answer. (You may use a calculator for this problem.)

5. (a) Find the inverse of the following functions.

(i) $f(x) = (2x + 1)^2$

(ii) $f(x) = e^{3x-2} - 6$

(b) If $f(x) = \sin 2x$ and $g(x) = 3^{x-1}$, find the following.

(i) $f \circ g(x)$

(ii) $g \circ f(x)$

6. (a) Evaluate the following.

(i) $\log_3 \frac{1}{27}$.

(ii) $\log_5 7$.

(b) Solve the following equations.

(i) $\log_2(3 - 2x) = 3$.

(ii) $e^{5x} - 9 = 0$.

7. (a) John deposited \$18,000 today in a bank where the interest rate is 5% compounded continuously according to the formula $A(t) = P e^{rt}$.

(i) How much will he have after 6 years.

(ii) How long does it take to double his money?

- (b) A certain radioactive material decays according to the formula $n(t) = n_0 e^{-0.0231t}$

(i) If in 2010 we have 80 gram of this material, how much will remain in 2025.

(ii) Find the half life of this material?

8. (a) Fill in the table using exact values.

θ	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
$\sin \theta$					
$\cos \theta$					
$\tan \theta$					

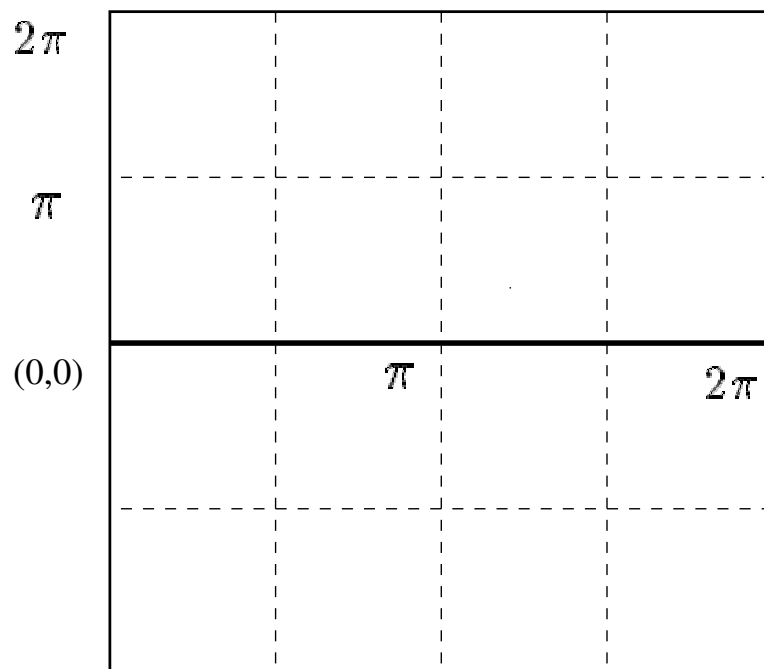
- (b) Find the reference numbers for the angles below and the **exact value** of the following. (Answers in decimal will recieve a zero.)

(i) $\cos(120^\circ)$

(ii) $\tan(\frac{5\pi}{4})$

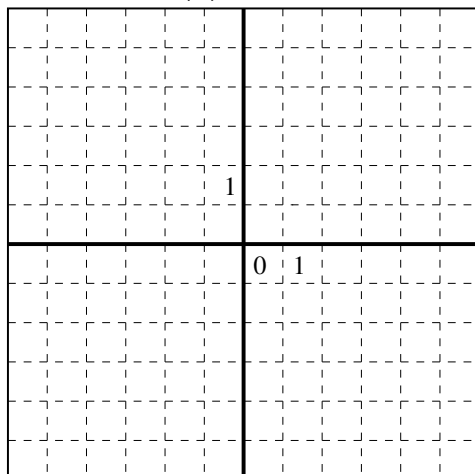
9. (a) Let $\cos \theta = -3/5$, and $\theta > 0$ is in quadrant III. Find the exact values of the remaining five trigonometric functions.

- (b) Sketch **one period** of the graph of $y = 3 \sin(2x)$ to scale. Find the amplitude and period. Mark five **equidistant** points on the x-axis and the values of the function at those points on the graph.

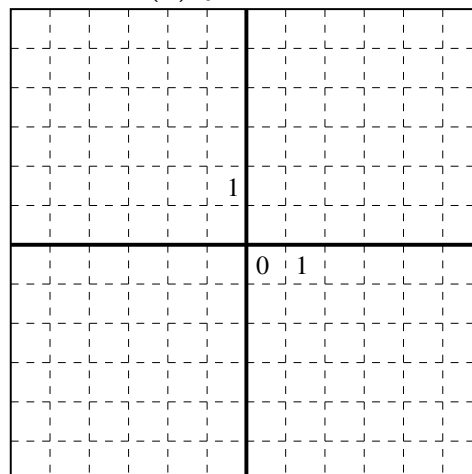


10. Sketch the graph of any five of the functions below.

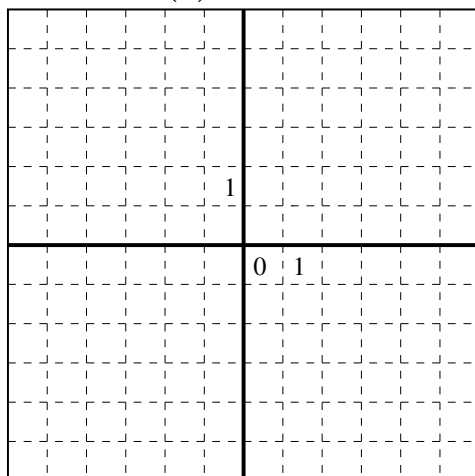
(1) $y = 2$



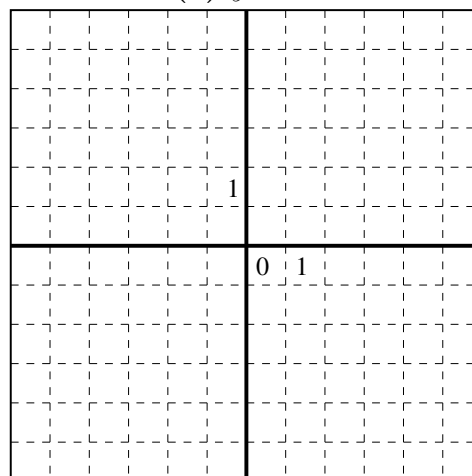
(2) $y = x^2 - 1$



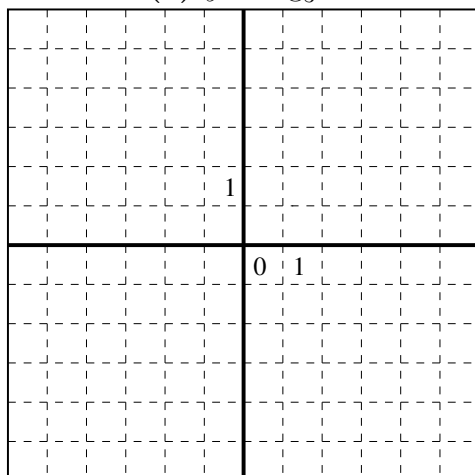
(3) $x = -3$



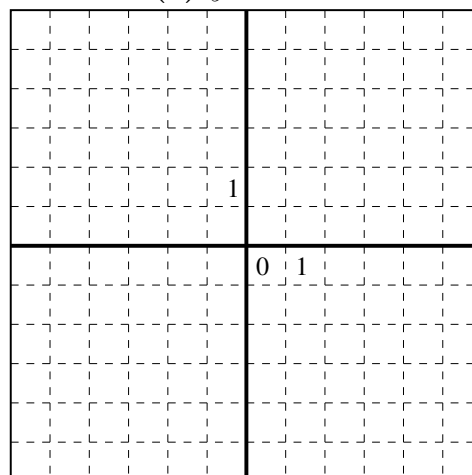
(4) $y = 2^x$



(5) $y = \log_3 x$



(6) $y = x + 2$



ROUGH WORK