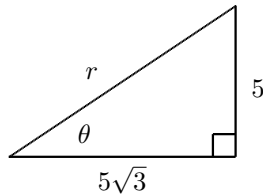


**Practice: 3/4 the way through**

Name:

Per:

- I. (3 points) Graph  $f(x) = -x^2 - 5x - 6$  label the vertex, the  $y$  intercept and the  $x$  intercepts
- II. (2 points) Find the equation of the parabola whose vertex is at  $(2, -3)$  and goes through  $(0, -6)$
- III. (3 points) Consider the following triangle:



- IV. (5 points) Graph  $y = -2\sin(4x + \pi)$   
In general  $y = a\sin(bx + c)$
- (a)  $b =$
- (b)  $c =$
- (c) Period:  $\frac{2\pi}{b} =$
- (d) Phase shift starting point:  $-\frac{c}{b} =$
- (e) Graph:
- V. (4 points) Consider the function

$$f(x) = \frac{3x^2 + x}{4x^2 - 3}$$

- (a) What is the domain of  $f$ ?
- (b) What are the equations of the two vertical asymptotes?
- (c) What is the equation of the horizontal asymptote?
- (d) What are the coordinates of the points that are the  $x$  and  $y$  intercepts of  $f$ ?
- VI. (2 points) Consider the function

$$g(x) = x^3 - 7x^2 + 19x - 13$$

- (a) Use synthetic division to find a zero of  $g$ .
- (b) What are the other two zeros of  $g$ ?

VII. What is the exact value of

- (a)  $\sin \frac{\pi}{6} =$
- (b)  $\tan \frac{\pi}{4} =$
- (c)  $\cos \frac{\pi}{2} =$
- (d)  $\sec \frac{\pi}{3} =$
- (e)  $\sin \frac{\pi}{2} =$

- VIII. Convert to radians
- (a)  $225^\circ =$
- (b)  $135^\circ =$
- (c)  $180^\circ =$
- (d)  $-330^\circ =$

IX. Find the inverse  $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}^{-1} =$

X. The order of  $\begin{bmatrix} 2 & 1 \\ 1 & 3 \\ -1 & 2 \end{bmatrix}$  is

XI. True (a) or False (b):

$\begin{bmatrix} 1 & 1 & 3 & 1 \\ 0 & 2 & 1 & 3 \\ 0 & 0 & 0 & 2 \end{bmatrix}$  is in reduced row-echelon form

XII. The function  $f(x) = \sin x$  is zero

- (a) When  $x$  is an integer multiple of  $\pi$
- (b) When  $x$  is an odd multiple of  $\frac{\pi}{2}$
- (c)  $f(x)$  is never zero

XIII. The following is a reduced row echelon matrix that represents a dependent system of equations. What is  $x$  in terms of any arbitrary  $z$

$$\begin{bmatrix} 1 & 1 & 3 & 3 \\ 0 & 1 & 1 & 6 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

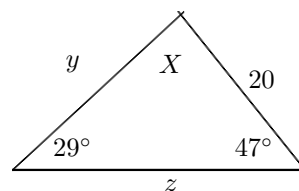
XIV. If we define  $f(x) = x^3 + 2$ , is it even, odd or neither?

XV. What is the graph of  $f(x) = \tan(x)$ ?

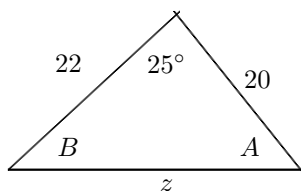
XVI. Which is the graph of  $f(x) = \sec(2x)$ ?

XVII. (5 points) Consider an investment of \$10,000 that pays 5% interest. If interest is compounded quarterly, what is the balance after 3 years? If interest is compounded monthly? If interest is compounded continuously?

XVIII. (1 point) Use the Law of Sines below:  
(Round your answer to 2 decimal places)



- XIX. (2 points) Use the Law of Cosines below:  
(Round your answer to 2 decimal places)

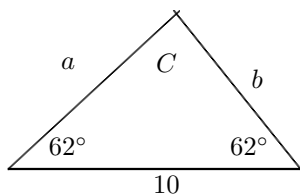


- XX. (3 points) The cost of making widgets depends upon the number of widgets produced. If  $x$  represents the number of units manufactured, then the cost in dollars can be computed by the following function:

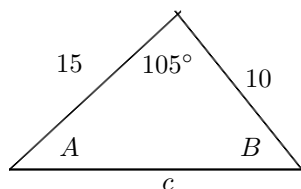
$$C(x) = 150,000 - 110x + .055x^2$$

What is the cost of making 10 units? What is the best  $x$  so that cost is at a minimum?

What is the lowest cost?



- XXI.



- XXII.

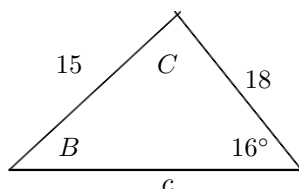
- XXIII. If  $\sin x^\circ = \frac{4}{5}$ , then  $x^\circ \approx$

- XXIV. What is determinant of:

$$\begin{vmatrix} 5 & 1 \\ 1 & -1 \end{vmatrix}$$

- XXV. Use Cramer's Rule to solve the system:

$$\begin{aligned} 5x + y &= 11 \\ x - y &= 1 \end{aligned}$$



- XXVI.

How many solutions for  $B$ ?

- XXVII. Multiply

$$\begin{bmatrix} 2 & 1 & 1 \\ 1 & -1 & 5 \\ 2 & 0 & 2 \end{bmatrix} \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix} =$$

- XXVIII. Consider the relation  $\{(5, 2), (6, 3), (7, 4)\}$ .

- The domain is
- The range is
- Is this relation a function?
- This is one-to-one?

- XXIX. If  $f(x) = 2x^2 + x + 3$ , what is the difference quotient between 1 and 2? *Hint: This is the slope between  $(1, f(1))$  and  $(2, f(2))$*

- XXX. Use partial fraction decomposition to find A and B:

$$\frac{5x - 8}{(x - 2)(x - 1)} = \frac{A}{x - 2} + \frac{B}{x - 1}$$

- XXXI. What is the vertex of  $f(x) = (x - 3)^2 + 2$ ?

- XXXII. What is the complex conjugate of  $2 + i$ ?

- XXXIII. What are the square roots of  $-49$ ?

- XXXIV. Simplify  $\frac{8 + 2i}{2i}$

- XXXV. Expand  $\log_3 4\sqrt{x}$

- XXXVI. Simplify  $4 \log_5 x - \log_5 y$

- XXXVII. Solve for  $x$ :  $2^{2x} + 3(2^x) = 10$

- XXXVIII. If it takes 10 years to triple your investment (Compounded continuously), what is the annual percentage rate (APR)?

- XXXIX.  $\log_3 8 \cdot \log_8 9 =$

- XL. 4 bunnies after 8 weeks become 25 bunnies. At this rate, how long before they are 100?

- XLI. The half life of Plutonium is 14.4 years. How long will it take to be only 25 percent?

- XLII. Find the equation of line that connects  $(0, 2)$  with  $(5, 10)$

- XLIII. Find the equation of parabola that connects  $(2, 0)$  with vertex  $(5, 10)$

- XLIV. Find the equation of exponential function that connects  $(0, 1)$  with  $(5, 10)$

### Hints & Solutions

1. Vertex:  $(-\frac{5}{2}, \frac{1}{4})$  intercepts:  $(-3, 0), (-2, 0), (0, -6)$
2.  $y = -\frac{3}{4}(x-2)^2 - 3$
3.  $r = 10, \theta = 30^\circ$
4.  $b = 4, c = \pi$  Period  $= \frac{\pi}{2}$  Start at  $(-\frac{\pi}{4}, 0)$  then down to minimum at  $(-\frac{\pi}{8}, -2)$  up to  $(0, 0)$  then maximum at  $(\frac{\pi}{8}, 2)$  then complete one cycle with  $(\frac{\pi}{4}, 0)$
5. domain:  $x \neq \pm \frac{\sqrt{3}}{2}$  asymptotes at  $x = \frac{\sqrt{3}}{2}$  and  $x = -\frac{\sqrt{3}}{2}$ , horizontal asymptote  $y = \frac{3}{4}$  intercepts  $(0, 0), (-\frac{1}{3}, 0)$
6. zeros:  $1, 3 \pm 2i$
7.  $a. \frac{1}{2}, b. 1, c. 0, d. 2, e. 1$
8.  $a. \frac{5\pi}{4}, b. \frac{3\pi}{4}, c. \pi, d. \frac{\pi}{6}$
9.  $\begin{bmatrix} \frac{2}{7} & -\frac{1}{7} \\ \frac{1}{7} & \frac{3}{7} \end{bmatrix}$
10.  $3 \times 2$
11. No, leading term of second row should be a 1
12. integer multiples of  $\pi$
13.  $y = 6 - z$  so  $x = 3 - 3z - (6 - z) = -3 - 2z$
14. neither as  $f(-x) = -x^3 + 2$
15. asymptotes at odd multiples of  $\frac{\pi}{2}$  zeros at integer multiples of  $\pi$
16. asymptotes are at intervals of  $\frac{\pi}{4}$  starting
17. \$11,607.50, \$11, 614.70 , \$11, 618.30
18.  $y = \frac{20 \sin 47}{\sin 29} \approx 30.1707586268$
19.  $z = \sqrt{20^2 + 22^2 - 2(20)(22) \cos 25} \approx 9.2978$
20.  $f(10) = \$148,906$ . 1,000 units is the best with a cost of \$95,000
21.  $a = b = \frac{10 \sin 62}{\sin 56} \approx 10.65^\circ$
22.  $x = \sqrt{10^2 + 15^2 - 300 \cos 105} \approx 20.066$
23.  $\sin^{-1} .8 \approx 53.13^\circ$
24. -6
25.  $x = \frac{D_x}{D} = \frac{-12}{-6} = 2, y = \frac{D_y}{D} = \frac{-6}{-6} = 1$
26. two solutions possible:  $B = \sin^{-1}(\frac{18 \sin 16}{15}) \approx 19.315$   
so the alternate  $B' = 180 - 19.315 = 160.685$
27.  $\begin{bmatrix} 8 \\ 14 \\ 6 \end{bmatrix}$
28. domain  $\{5, 6, 7\}$  range  $\{2, 3, 4\}$ , a one-to-one function
29. 7
30.  $A = 2, B = 3$  So we conclude  
$$\frac{5x-8}{(x-2)(x-1)} = \frac{2}{x-2} + \frac{3}{x-1}$$
31.  $(3, 2)$
32.  $2 - i$
33.  $\pm 7i$
34.  $1 - 4i$
35.  $\log_3 4 + \frac{1}{2} \log_3 x$
36.  $\log_5(x^4 y)$
37.  $(2^x + 5)(2^x - 2) = 0$  so  $x = 1$
38.  $\frac{\ln 3}{10} \approx 10.986\%$
39. 2
40. rate is  $\frac{\ln 25/4}{8}$  so  $t = \frac{8 \ln 100}{\ln(25/4)}$  about 20.1035 weeks
41. rate  $= \frac{\ln .5}{14.4}, t = \frac{14.4 \ln .25}{\ln .5}$  or about 28.8 years
42.  $y = \frac{10}{3}x - \frac{20}{3}$
43.  $y = -\frac{10}{9}(x-5)^2 + 10$
44.  $e^{5r} = 10$  so  $r = \frac{\ln 10}{5}$  thus  
 $y = e^{x \ln(10)/5} \approx e^{.461517x}$