

## PreCalculus Diagnostic Test

Success in a first year Calculus class is highly dependent on your algebra skills. The following is a self-diagnostic test to be taken by students prior to entering a Calculus class (Math 103 or Math 110).

Instructions: Complete the following test in no more than 90 minutes.  
Do not use a calculator for any questions.  
Do not refer to books, notes, or other material while completing the test.  
Only select one answer per question.

Note: Questions #33-40 are split into Section A and Section B.  
If you plan to enrol in Math 103, complete the questions from Section A only.  
If you plan to enrol in Math 110, complete the questions from Section B only.

Once you have completed all 40 questions, refer to the last page for scoring and recommendations.

1.  $2\left(\frac{1}{4} + \frac{2}{3}\right) =$

a)  $\frac{22}{24}$

b)  $\frac{11}{6}$

c)  $\frac{6}{7}$

d)  $\frac{6}{14}$

e)  $\frac{4}{7}$

$2\left(\frac{1}{4} + \frac{2}{3}\right) =$

$2\left(\frac{3}{12} + \frac{8}{12}\right) =$

$\left(\frac{2}{1}\right)\left(\frac{11}{12}\right)$   
 $\frac{2 \cdot 11}{1 \cdot 12} = \frac{22}{12} = \frac{11}{6}$

2. Express  $\frac{1}{y^2} + \frac{2}{x^2y} + \frac{1}{x^2y^3}$  as a single fraction:

a)  $\frac{x^2y + 2y^2 + 1}{x^2y^3}$

b)  $\frac{4}{x^4y^6}$

c)  $\frac{x+2y}{x^2y^3}$

d)  $\frac{x^2+3y}{x^2y^2}$

e)  $\frac{x^4y^4 + 2xy^5 + x^2}{x^4y^6}$

$\left(\frac{1}{y^2}\right) + \left(\frac{2}{x^2y}\right) + \left(\frac{1}{x^2y^3}\right)$

$\left(\frac{x^2y}{x^2y^3}\right) + \left(\frac{2y^2}{x^2y^3}\right) + \left(\frac{1}{x^2y^3}\right)$

$\frac{(x^2y) + (2y^2) + (1)}{x^2y^3}$

$\frac{x^2y + 2y^2 + 1}{x^2y^3}$

3. Simplify  $\frac{(2xy^2)^3}{(x^2y)^2}$

a)  $6xy^4$

b)  $8x^7y^8$

c)  $\frac{6y^3}{x}$

d)  $\frac{8y^3}{x}$

e)  $\frac{8y^4}{x}$

$\frac{(2xy^2)^3}{(x^2y)^2} =$   
 $\frac{(2^3) \cdot x^3 \cdot y^6}{x^4 \cdot y^2}$

$\frac{8 \cdot x^3 \cdot y^6}{x^4 \cdot y^2}$

$6 - 2 = 4$

$8 \cdot x \cdot y^4$

$\frac{8y^4}{x}$



4.  $16^{-1/4} \times 4^0 =$

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

$16^{-1/4} \times 4^0$

$16^{-1/4}$

$\frac{1}{16^{1/4}} = \frac{1}{\sqrt[4]{16}} = \frac{1}{2}$

$x^{m/n} = \sqrt[n]{x^m}$

$2^4 = 16$

$\sqrt[4]{16} = 2$



5. One factor of  $3x^2 + 11x - 4$  is

- a)  $3x+1$
- b)  $x-4$
- c)  $3x-1$
- d)  $x-2$
- e)  $3x+4$

$3x^2 + 11x - 4$

✓ mult -12  
add 11

$3x^2 + 11x - 4$

$+12 - 1$

$3x^2 + 12x - x - 4$

Factor by Grouping

$\frac{3x^2 + 12x - x - 4}{3x(x+4) - 1(x+4)} = (x+4)(3x-1)$

6. Factor  $x^2 + 2x - 8$

- a)  $(x+2)(x-4)$
- b)  $(x+8)(x-1)$
- c)  $(x-8)(x+1)$
- d)  $(x-2)(x+4)$
- e)  $(x-4)(x-2)$

$x^2 + 2x - 8$

$(4) (-2)$

$(x-2)(x+4)$



7. If  $x^2 - 4x + 1 = 0$ , then  $x =$

- a)  $2 + \sqrt{3}, 2 - \sqrt{3}$
- b)  $-2 + \sqrt{3}, -2 - \sqrt{3}$
- c)  $2 + \sqrt{5}, 2 - \sqrt{5}$
- d)  $\sqrt{3}, -\sqrt{3}$
- e) None of the above.

$x^2 - 4x + 1 = 0$

$\frac{4 \pm \sqrt{4^2 - 4(1)(1)}}{2}$

2

$\frac{4 \pm \sqrt{16-4}}{2}$

$\frac{4 \pm \sqrt{12}}{2}$

$4 \pm \sqrt{4^2 - 3}$

$\frac{4 \pm 2\sqrt{3}}{2}$

$\frac{2(2 \pm \sqrt{3})}{2} = 2 \pm \sqrt{3}$

8. If  $|2x-3|=9$ , then  $x =$

- a) -6 or 3
- b) -6 or -3
- c) 6 or -3
- d) 6 or 3
- e) None of the above.

$|2x-3|=9$

$2x = 9+3$

$x=6$

$\frac{2x}{2} = \frac{12}{2}$

$2x-3 = -9$

$\frac{2x}{2} = \frac{-6}{2}$

$x=-3$

check:

$2(6)-3=9$

$2(-3)-3=-9$

$-6-3=-9$

$12 - 3 = 9 \checkmark$

9. If  $|x-3| > 5$ , then

- a)  $-2 < x < 8$
- b)  $-8 < x < 2$
- c)  $x < -8 \cup x > 2$
- d)  $x < -2 \cup x > 8$
- e)  $x < -8 \cup x > -2$

$|x-3| > 5$

$x-3 > 5$   
 $+3 \quad +3$   
 $x > 8$

$x-3 < -5$   
 $+3 \quad +3$   
 ~~$x < -2$~~

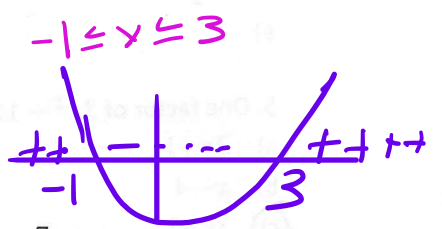
$x < -2$

10. If  $x^2 - 2x - 3 \leq 0$ , then

- a)  $x \leq -1 \cup x \geq 3$
- b)  $x \leq -3 \cup x \geq 1$
- c)  $-3 \leq x \leq 1$
- d)  $1 \leq x \leq 3$
- e)  $-1 \leq x \leq 3$

$x^2 - 2x - 3 \leq 0$

$(x+1)(x-3)$   
 $x \geq -1 \quad x \leq 3$



$x^2 - 2x - 3 \leq 0$

11. Solve the following pair of equations for  $x$  and  $y$ :  $2x - y = 5$  and  $4x + y = 7$

- a)  $x = -2, y = 1$
- b)  $x = 2, y = -1$
- c)  $x = 1, y = -3$
- d)  $x = -6, y = -17$
- e)  $x = 2, y = 1$

$2x - y = 5 \quad 4x + y = 7$

$2x - (-4x + 7) = 5$   
 $-4x + 7 = y$

$2x + 4x - 7 = 5$   
 $6x - 7 = 5$   
 $6x = 12$   
 $x = 2$

$4(2) + y = 7$   
 $6 + y = 7$   
 $y = 1$

12.  $\frac{\frac{1}{xy} - 1}{\frac{1}{x^2} - \frac{y}{x}} =$

- a)  $\frac{y}{x}$
- b)  $\frac{x}{y}$
- c)  $\frac{1-xy}{x}$
- d)  $xy$
- e)  $xy-1$

$\frac{\frac{1}{xy} - 1}{\frac{1}{x^2} - \frac{y}{x}} = \frac{\frac{1}{xy} - \frac{xy}{xy}}{\frac{1}{x^2} - \frac{xy}{xy}} = \frac{\frac{1-xy}{xy}}{\frac{1-xy^2}{xy^2}}$

~~$\frac{1-xy}{xy} \cdot \frac{xy^2}{1-xy^2}$~~   
 ~~$\frac{1-x}{y} \cdot \frac{x}{1-y} = \frac{x-x^2}{y(1-y)}$~~

Correct Solution

$\frac{\frac{1}{xy} - \frac{xy}{xy}}{\frac{1}{x^2} - \frac{xy}{xy}} = \frac{\frac{1-xy}{xy}}{\frac{1-xy^2}{x^2}} = \frac{1-xy}{xy} \cdot \frac{x^2}{1-xy^2} = \frac{x^2}{xy} = \frac{x}{y}$





13.  $\frac{1}{2x+18} - \frac{x}{x^2-81} =$

a)  $\frac{-1}{2(x-9)}$

b)  $\frac{-3(x+3)}{2(x+9)(x-9)}$

c)  $\frac{-1}{2(x+9)}$

d)  $\frac{-9}{(x+9)(x-9)}$

e)  $\frac{1-x}{(x-9)(x+7)}$

$$\frac{1}{2x+18} - \frac{x}{x^2-81}$$

$$\frac{1}{2(x+9)} - \frac{x}{(x-9)(x+9)}$$

$$\frac{1}{2(x-9)(x+9)} - \frac{x}{x^2-81}$$

$$\frac{1}{2(x^2-81)} - \frac{x}{x^2-81}$$

$$\frac{\frac{1}{2}}{x^2-81} - \frac{x}{x^2-81}$$

$$\frac{\frac{1}{2} - x}{x^2-81}$$

$$\frac{81}{2}$$

$$\frac{162}{2}$$

$$18 \sqrt{\frac{162}{2}}$$

$$\frac{162}{2}$$

$$\frac{81}{2}$$

$$\frac{1}{2x+18} - \frac{x}{x^2-81}$$

$$\frac{-x-9}{2(x-9)(x+9)}$$

$$= \frac{-(x+9)}{2(x-9)(x+9)} = \frac{-1}{2(x-9)}$$

14. If  $x=11$  and  $y=25$ , then  $(x+y)^{-1/2} =$

- a) 6
- b) -6
- c)  $\frac{\sqrt{11}}{55}$
- d)  $\frac{1}{6}$
- e)  $-\frac{1}{6}$

$x=11 \quad y=25$   
 $(x+y)^{-1/2} = (11+25)^{-1/2}$   
 $(36)^{-1/2} = \frac{1}{36^{1/2}}$   
 $= \frac{1}{6}$

15. Factor  $16x^4 - 1$

- a)  $(2x-1)^2(2x+1)^2$
- b)  $(4x-1)^2(4x+1)^2$
- c)  $(2x-1)(2x+1)(4x^2+1)$
- d)  $(2x-1)(2x+1)(2x^2-1)$
- e)  $(2x-1)(2x+1)(2x^2+1)$

$16x^4 - 1$

$(4x^2-1)(4x^2+1)$   
 $(2x-1)(2x+1)(4x^2+1)$

$$\frac{5}{x+2} = \frac{5-x}{x-2} + 1$$

16. If  $\frac{5}{x+2} = \frac{5-x}{x-2} + 1$ , then  $x =$

- a) 2
- b) -8
- c) 8
- d) -2
- e) None of the above.

$$\frac{5}{x+2} = \frac{5-x}{x-2} + 1$$

$$-1 \frac{(x+2)(5-x)}{(x+2)(x-2)} - \frac{5(x-2)}{x+2(x-2)}$$

$$\frac{(-x^2 - 2x + 5x + 10)}{x^2 - 4} - \frac{5x - 10}{x^2 - 4}$$

$$\frac{-x^2 + 3x + 10 - 5x + 10}{x^2 - 4}$$

$$\frac{-x^2 - 2x + 20}{x^2 - 4}$$

$$-(x^2 + 2x - 20)$$

$$\frac{2x + 20}{4} = 1$$

$$2x + 20 = 4$$

$$2x = -16$$

$$x = -8$$

17. If  $f(x) = x^2 - 1$  then  $f(x-1) =$

- a)  $x^2 - 2$
- b)  $x^2 - 2x - 2$
- c)  $x^2 - x$
- d)  $x^2 - 2x$
- e)  $x^2$

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

$$x^2 - 2x + 1 - 1 =$$

$$x^2 - 2x$$

18. Let  $x > 0$  and  $f(x) = \sqrt{4x+8}$  and  $g(x) = x^2 - 2$ . Evaluate  $g(f(x)) - f(g(x)) =$

- a)  $x$
- b) 0
- c)  $6x + 6$
- d)  $4x - 2$
- e)  $2x + 6$

$$= g(f(x)) - f(g(x))$$

$$= g(\sqrt{4x+8})^2 - 2$$

$$4x + 8 - 2 = 4x + 6 - 2x = 6$$

$$f(g(x)) = \sqrt{4(x^2 - 2) + 8}$$

$$\sqrt{4x^2 - 8 + 8}$$

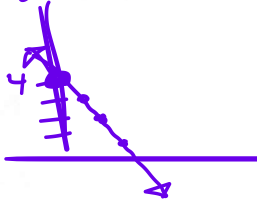
$$2x \times 2x = 4x^2$$

$$2x + 6$$

19. The graph of the equation  $y = 4 - x$  is

- a) a parabola with vertex  $(x, y) = (1, 4)$
- b) a parabola with vertex  $(x, y) = (-1, 4)$
- c) a line with slope -1 and intercept 4
- d) a line with slope 4 and intercept -1
- e) a circle with radius 2

$$y = 4 - x$$



20. The graph of the equation  $y^2 = 4 - x^2$  is

- a) a parabola with vertex  $(x, y) = (1, 4)$
- b) a parabola with vertex  $(x, y) = (-1, 4)$
- c) a line with slope -1 and intercept 4
- d) a line with slope 4 and intercept -1
- e) a circle with radius 2

$$x^2 + y^2 = 4$$

$$(x-h)^2 + (y-k)^2 = r^2$$

$$x^2 + y^2 = 2^2$$

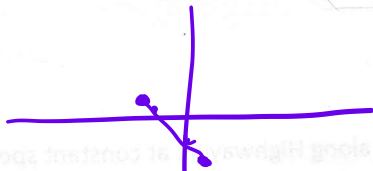
$$r = 2$$

center  $(0, 0)$

$$(x-0)^2 + (y-0)^2 = 4$$

21. Find the equation of the straight line through points  $(x, y) = (-2, 1)$  and  $(x, y) = (1, -2)$ .

- a)  $y = x - 1$
- b)  $y = x + 1$
- c)  $y = -2x + 1$
- d)  $y = 1 - x$
- e)  $y = -x - 1$



$$y = mx + b$$

$$y = -1x - 1$$

22. Find the equation of the line perpendicular to  $x + 3y = 4$  through the point  $(x, y) = (1, 5)$ .

- a)  $3x - y = -2$
- b)  $x + 3y = 16$
- c)  $3x + y = 8$
- d)  $x - 3y = -14$
- e)  $3x + y = 4$

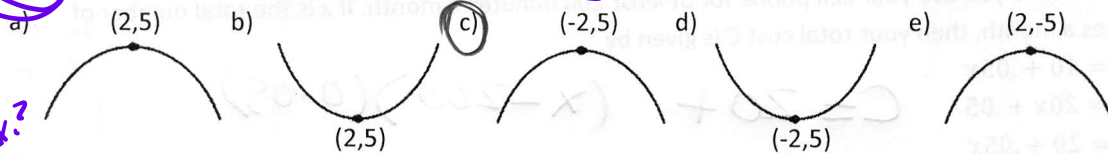
$$x + 3y = 4$$

$$1 + 3(5) = 4$$

$$1 + 15 = 4$$

$$\frac{-b}{2a} = \frac{4}{2(1)} = -2$$

23. Which graph best represents the equation  $y = -x^2 - 4x + 1$ ?



How do we know the "x" of the vertex?

24. The line  $y = \frac{1}{2}x + 1$  intersects the parabola  $y = x^2 - 4x + 3$  at

- a)  $x = 4$  and  $x = \frac{1}{2}$
- b)  $x = 1$  and  $x = \frac{1}{4}$
- c)  $x = -\frac{1}{2}$  and  $x = 4$
- d)  $x = \frac{1}{2}$  and  $x = \frac{1}{4}$
- e) None of the above.

$$\frac{1}{2}x + 1 = x^2 - 4x + 3$$

$$-x^2 + 4x + \frac{1}{2}x$$

$$-x^2 + 4.5x = 2$$

$$-x^2 + 4.5x - 2 = 0$$

$$-2x^2 + 9x - 4 = 0$$

systems of equations

$$x = \frac{-9 \pm \sqrt{81 - 4(-2)(-4)}}{-4}$$

$$x = \frac{-9 \pm \sqrt{49}}{-4}$$

$$x = \frac{-9 \pm 7}{-4} = 4 \frac{1}{2}$$

25. The parabolas  $y = x^2 + 2x + 2$  and  $y = -2x^2 + 8x - 7$  intersect at points  $(x, y) =$

- a)  $(1, 1)$  and  $(3, -2)$
- b)  $(1, 1)$  and  $(3, 17)$
- c)  $(-1, 1)$  and  $(3, -2)$
- d)  $(-1, -1)$  and  $(3, 17)$
- e) none of the above

$$\text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$y = x^2 + 2x + 2$$

$$y = -2x^2 + 8x - 7$$

26. After a 20% price decrease, the cost of an item is \$4.20. What was the original price?

- a) \$4.40
- b) \$5.04
- c) \$5.00
- d) \$4.96
- e) \$5.25

$$x(.80) = 4.20$$

$$x = \frac{4.20}{.80} = 5.25$$

How do you know this mentally

$$0.8x = 4.20$$

$$x = \frac{4.20}{0.80} = \frac{420}{80}$$

$$x =$$

$$8 \overline{) 42.00} \\ \underline{40} \\ 20$$

$$\begin{array}{r} 20 \\ -16 \\ \hline 40 \end{array}$$

$$\frac{1}{2} + \frac{1}{3} = \frac{1}{T}$$

$$\frac{5}{6} = \frac{1}{T}$$

27. Adam can shovel a driveway in two hours. Bev can shovel the same driveway in three hours. How long would it take them working together?

- a) 2 hours 30 minutes
- b) 2 hours 20 minutes
- c) 48 minutes
- d) 1 hour 12 minutes
- e) 1 hour 36 minutes

$$\frac{7}{10} = \frac{x}{60}$$

$$\frac{1}{t_1} + \frac{1}{t_2} = \frac{1}{t_{total}}$$

$$\frac{2}{10} = \frac{x}{60}$$

$$ST = 6$$

$$T = 6/5 = 1.2$$

$$= 1 \text{ hr} + 12 \text{ min}$$

28. A car leaves Regina at 1 PM and drives along Highway #1 at constant speed 85 km/h. A 2<sup>nd</sup> car leaves Regina at 1:30 PM and follows the same highway at constant speed 110 km/h. At what time will it pass the first car?

- a) 1:47 PM
- b) 2:07 PM
- c) 2:42 PM
- d) 3:12 PM
- e) 3:30 PM

$$1:30 + 1.7 \text{ hrs}$$

$$1:42 \text{ min}$$

$$3:12 \text{ pm}$$

1:30 pm      110t      second car      t=0 second

First car

$$\frac{1}{2} \cdot 85 + 85t$$

$$110t = \frac{85}{2} + 85t \Rightarrow 110t - 85t = \frac{85}{2}$$

$$25t = \frac{85}{2} \Rightarrow t = 1.7 \text{ hr}$$

29. A cell phone plan costs \$20 a month and includes 200 free minutes. Each additional minute costs 5 cents. Assume you use your cell phone for at least 200 minutes a month. If x is the total number of minutes a month, then your total cost C is given by

- a)  $C = 10 + .05x$
- b)  $C = 20x + .05$
- c)  $C = 20 + .05x$
- d)  $C = 20.05x$
- e)  $C = 30 + .05x$

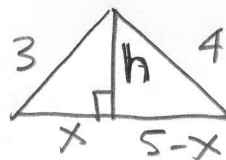
$$C = 20 + (x - 200)(0.05)$$

$$C = 20 + 0.05x - 10 = 10 + 0.05x$$

up to here  
Cameron

30. Find the area of the triangle that has sides with length 3, 4, and 5.

- a) 6
- b) 7.5
- c) 10
- d) 12
- e) 15



31. Find the distance between points  $(x, y) = (-1, 2)$  and  $(x, y) = (3, 4)$ .

- a) 5
- b)  $\sqrt{8}$
- c)  $\sqrt{10}$
- d)  $\sqrt{20}$
- e)  $\sqrt{40}$

$$\text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\sqrt{(3 + 1)^2 + (4 - 2)^2}$$

$$\sqrt{16 + 4}$$

$$\sqrt{20}$$

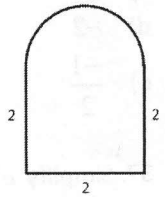


32. Find the total area of the given shape, a square with side length 2 topped by a semi-circle.

- a) ~~8 + π~~
- b) ~~2 + π~~
- c)  $4 + 4π$
- d)  $4 + \frac{π}{2}$
- e)  $4 + π$



$4 + \frac{1}{2}\pi r^2$   
 $\frac{1}{2}\pi 1^2$   
 $\frac{1}{2}\pi = \frac{\pi}{2}$   
 $4 + \frac{\pi}{2}$



**IMPORTANT:** If you plan to go on to Math 103, complete questions 33-40 in Section A. If you plan to go on to Math 110, skip Section A and complete questions 33-40 in Section B.

**SECTION A** – Complete these if you plan to go on to Math 103.

33. If  $\log_a 64 = 2$ , then  $a =$

- a) -8
- b) 32
- c) 128
- d) 4096
- e) 8

$\log_a 64 = 2$

$a^2 = 64$

$a = \pm 8$

$a = 8$

\* can't have negative base!

34.  $\log_{\frac{1}{3}} 27 =$

- a) 3
- b) 9
- c) -9
- d) -3
- e) none of the above

$a^2 = 64$

$a = 8$

$\log_{\frac{1}{3}} 27 = x$

$\frac{1}{3}^x = 27$

$(3^{-1})^x = 3^3$

$3^{-x} = 3^3$

$-x = 3$

$x = -3$

35. If  $\log x = 2$  and  $\log y = 4$ , then  $\log(xy^2) =$

- a) 16
- b) 12
- c) 32
- d) 10
- e) 8

$\log(xy) = \log x + \log y$

$\log(xy^2) = \log x + \log y^2$

$= \log x + 2 \log y$

$= 2 + 2(4) = 10$

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$\log x^r = r \log x$

$\log\left(\frac{x}{y}\right) = \log x - \log y$

$$\log_a x = \frac{\log_b x}{\log_b a}$$

$$\log_2 x = \frac{\ln x}{\ln 2}$$

36. If  $4^{x+1} = 8$ , then  $x =$

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

$$(2^2)^{x+1} = 2^3$$

$$2^{2x+2} = 2^3$$

$$2x+2 = 3$$

$$2x = 1$$

$$x = \frac{1}{2}$$

37. Simplify  $e^{4x-2} \cdot e^{x+1}$

- a)  $e^{5x-1}$
- b)  $e^{4x^2+2x-2}$
- c)  $e^{3x-3}$
- d)  $e^{3x-1}$
- e)  $e^3$

$$e^{4x-2} \cdot e^{x+1}$$

$$e^{5x-1}$$

38. If  $4^x = 40$ , then

- a)  $x = 10$
- b)  $\log_x 4 = 40$
- c)  $\log_{40} x = 4$
- d)  $\log_4 40 = x$
- e)  $\log_{40} 4 = x$

$$4^x = 40$$

$$\log_4 40 = x$$

$$4^x = 40$$

$$\log_4 4^x = \log_4 40$$

$$x = \log_4 40$$

$$\log_a a^x = x$$

$$a^{\log_a x} = x$$

39. If  $\log_2 x + \log_2 (x-2) = 3$ , then  $x =$

- a) 4, -2
- b) 4
- c) -2
- d) 2, -4
- e) None of the above

$$2 + 1 = 3$$

$$\log\left(\frac{u}{v}\right) = \log u - \log v$$

$$\log(uv) = \log u + \log v$$

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

Videos  
logarithmic  
equations

$$\log_a x = y$$

$$(x(x-2)) = 2^3$$

$$a^y = x$$

$$x^2 - 2x = 8$$

$$x^2 - 2x - 8 = 0$$

$$(x-4)(x+2) = 0$$

$$x-4 = 0$$

$$x+2 = 0$$

$$\underline{x = 4}$$

$$\underline{\cancel{x = -2}}$$

40.  $\log_5 \sqrt{5} = x$

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

$$5^x = \sqrt{5}$$

$$5^x = 5^{1/2}$$

$$\boxed{x = 1/2}$$

$$\log_a x = y$$

$$\underline{a^y = x}$$

SECTION B - Complete these if you plan to go on to Math 110.

33. How many degrees is  $\frac{\pi}{6}$  radians?

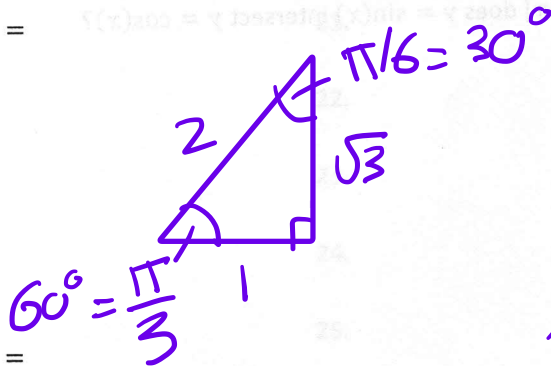
- a) 180
- b) 90
- c) 60
- d) 45
- e) 30

$$\boxed{\pi \text{ rad} = 180^\circ}$$

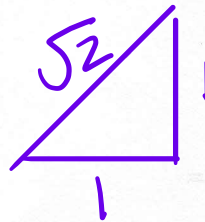
$$\frac{\pi}{6} \text{ rad} = \frac{180}{6} = 30^\circ$$

34.  $\sin(60^\circ) =$

- a) 0
- b)  $\frac{1}{2}$
- c)  $\frac{\sqrt{2}}{2}$
- d)  $\frac{\sqrt{3}}{2}$
- e) 1



$$\sin 60 = \frac{\sqrt{3}}{2}$$

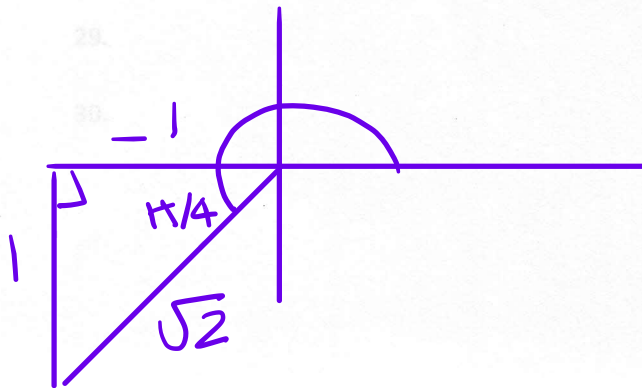


35.  $\cos\left(\frac{5\pi}{4}\right) =$

- a)  $\frac{\sqrt{3}}{2}$
- b)  $-\frac{\sqrt{3}}{2}$
- c)  $\frac{\sqrt{2}}{2}$
- d)  $-\frac{\sqrt{2}}{2}$
- e) None of the above.

$$\frac{5\pi}{4} = 1.25\pi$$

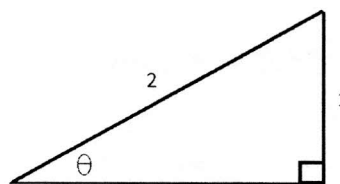
$$\cos\left(\frac{5\pi}{4}\right) = -\frac{1}{\sqrt{2}}$$





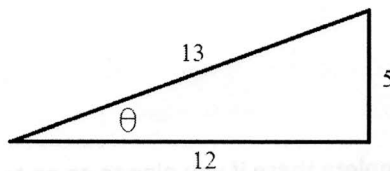
36. The angle  $\theta$  (in radians) in the given diagram is

- a)  $\frac{\pi}{8}$
- b)  $\frac{\pi}{6}$
- c)  $\frac{\pi}{4}$
- d)  $\frac{\pi}{3}$
- e)  $\frac{\pi}{2}$



37. In the given diagram,  $\tan\theta =$

- a)  $5/12$
- b)  $5/13$
- c)  $12/13$
- d)  $12/5$
- e)  $13/5$



38. Which of the following values is largest?

- a)  $\sin(30^\circ)$
- b)  $\sin(60^\circ)$
- c)  $\sin(70^\circ)$
- d)  $\sin(85^\circ)$
- e)  $\sin(100^\circ)$

39. At what points in the interval  $x \in [0, 2\pi]$  does  $y = \sin(x)$  intersect  $y = \cos(x)$ ?

- a)  $x = \frac{\pi}{4}$  and  $x = \frac{3\pi}{4}$
- b)  $x = \frac{\pi}{4}$  and  $x = \frac{5\pi}{4}$
- c)  $x = \frac{3\pi}{4}$  and  $x = \frac{5\pi}{4}$
- d)  $x = \frac{\pi}{4}$  and  $x = \frac{7\pi}{4}$
- e)  $x = \frac{3\pi}{4}$  and  $x = \frac{7\pi}{4}$

40.  $\sin^2\left(\frac{\pi}{7}\right) + \cos^2\left(\frac{\pi}{7}\right) =$

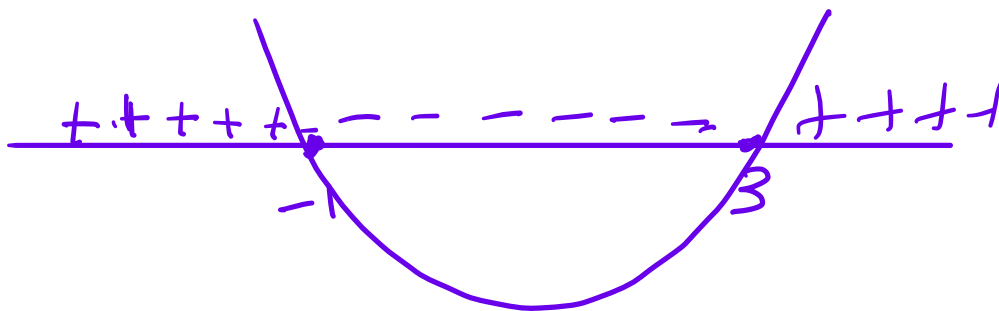
- a) 0
- b)  $\frac{\pi^2}{49}$
- c) 1
- d)  $\frac{\pi}{7}$
- e) None of the above.

$$x^2 - 2x - 3 \leq 0$$

$$(x-3)(x+1) \leq 0$$

$$\text{STI)} (x-3)(x+1) = 0$$

$$x = 3 \quad x = -1$$



$$x < -1 \quad x^2 - 2x - 3 \\ x = -2 \Rightarrow 4 + 4 - 3 = 5$$

$$-1 < x < 3 \quad x = 1 \quad x^2 - 2x - 3 \\ 1 - 2 - 3 = -4$$

$$x > 3 \quad x = 4 \quad x^2 - 2x - 3 \\ 16 - 8 - 3 = 5$$

$$\underline{-1} \leq x \leq \underline{3}$$

$$\frac{\frac{1}{xy} - 1 \cdot \frac{xy}{xy}}{\frac{1}{x^2} - \frac{y}{x} \cdot \frac{x}{x}} = \frac{1-xy}{xy} \cdot \frac{x^2}{1-xy}$$

$$\frac{1-xy}{xy} \cdot \frac{x^2}{1-xy} = \frac{x^2}{xy} = \frac{x}{y}$$

$$\frac{x-y}{x} = \frac{x(1-y/x)}{x} = \boxed{1-y/x}$$

$$a-b$$

$$a(1-\frac{b}{a})$$

0.15)

$$\frac{1}{2x+18} - \frac{x}{x^2-81}$$

$$\frac{x-9}{(x-9)2(x+9)} - \frac{x}{(x-9)(x+9)} \cdot \frac{2}{2}$$

$$\underline{\underline{x-9-2x}}$$

$$2(x-9)(x+9)$$

$$\frac{-x-9}{2(x-9)(x+9)}$$

---

16)

$$\frac{5}{x+2} = \frac{5-x}{x-2} + \frac{1}{1}$$

$$x\left(\frac{y}{z}\right) = \frac{xy}{z}$$

$$(x+2)(x-2)$$

$$\cancel{(x+2)}(x-2)\left[\frac{5}{\cancel{x+2}}\right] = \left[\left(\frac{5-x}{x-2} + 1\right)\right](x+2)\cancel{(x-2)}$$

$$5(x-2) = (5-x)(x+2) + (x+2)(x-2)$$

$$5x - 10 = \underline{5x} + 10 - \cancel{x^2} - \underline{2x} + \cancel{x^2} - 4$$

$$5x - 10 = 3x + 6$$

$$2x = 16$$

$$x = 8$$

$$\frac{5}{x+2} = \frac{5-x}{x-2} + \frac{1}{1}$$

method 2

$$\frac{5}{x+2} - \left( \frac{5-x}{x-2} \right) = 1$$

$$\frac{x-2}{x-2} \frac{5}{x+2} - \left( \frac{5-x}{x-2} \right) \frac{x+2}{x+2}$$

$$\frac{5(x-2) - (5-x)(x+2)}{(x-2)(x+2)}$$

$$\frac{5x - 10 - (5x + 10 - x^2 - 2x)}{(x-2)(x+2)}$$

$$\cancel{5x} - 10 - \cancel{5x} - 10 + x^2 + 2x$$

$$\frac{x^2 + 2x - 20}{(x-2)(x+2)} \begin{matrix} \nearrow 1 \\ \searrow 1 \end{matrix}$$

$$x^2 + 2x - 20 = (x-2)(x+2)$$

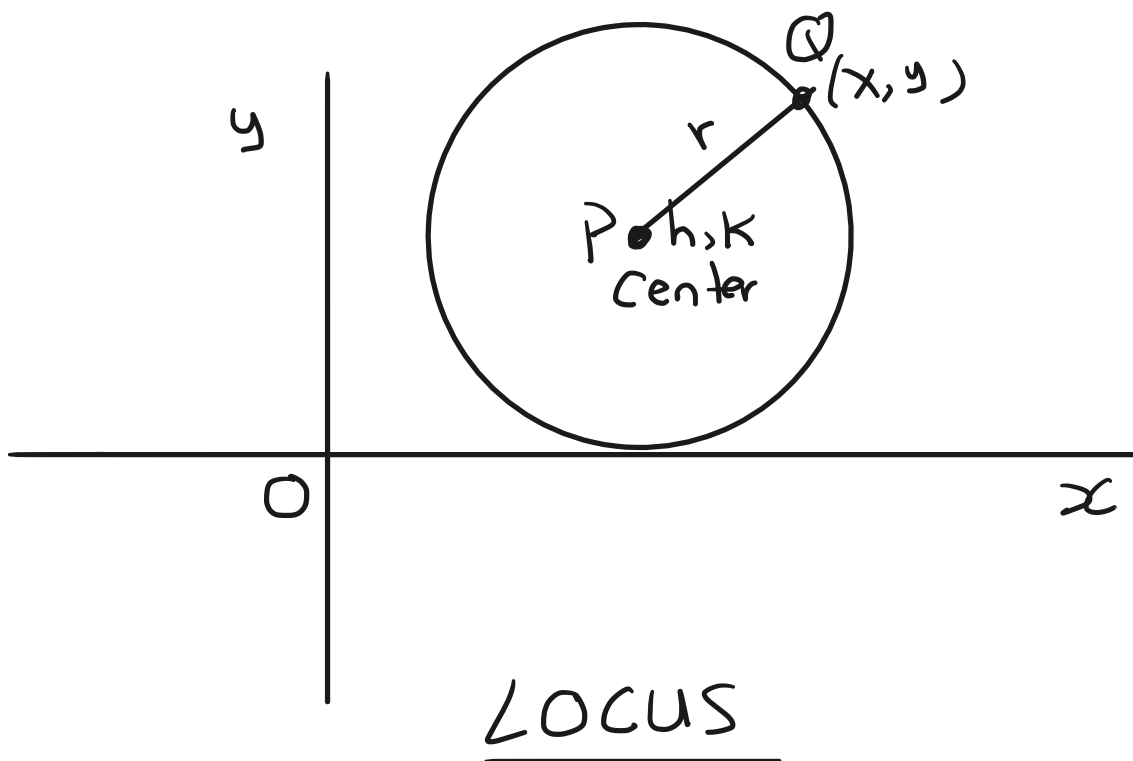
$$\cancel{x^2} + 2x - 20 = \cancel{x^2} - 4$$

$$2x - 20 + 4 = 0$$

$$2x - 16 = 0$$

$$2x = 16$$

$$\underline{x = 8}$$



$$r = \sqrt{(x-h)^2 + (y-k)^2}$$

$$\underline{r^2 = (x-h)^2 + (y-k)^2}$$

$$y = x^2 + 2x + 2$$

$$y = -2x^2 + 8x - 7$$

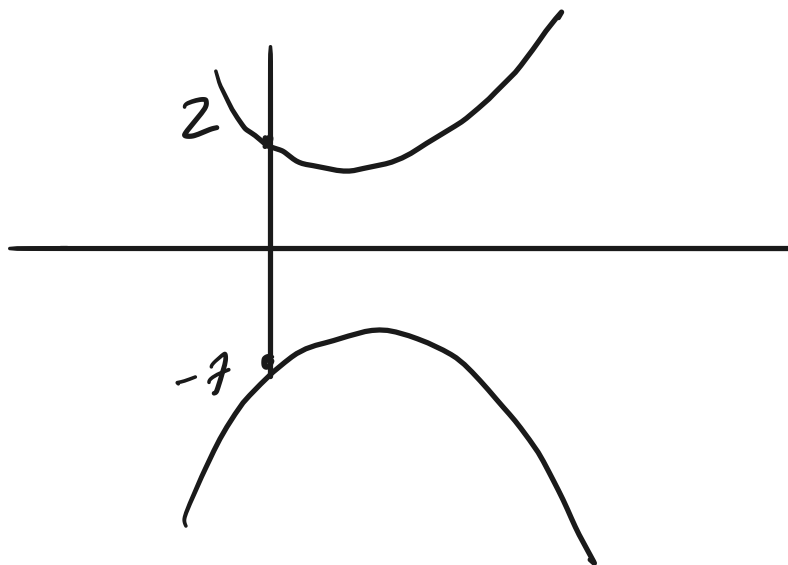
$$x^2 + 2x + 2 = -2x^2 + 8x - 7$$

$$3x^2 - 6x + 9 = 0$$

$$a = 3 \quad b = -6 \quad c = 9$$

$$x = \frac{6 \pm \sqrt{36 - 4(3)(9)}}{6}$$

$$x = \frac{6 \pm \sqrt{\text{neg}}}{6}$$





28)

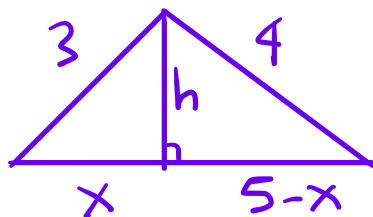
$$t=0 \quad l=30 \text{ PM}$$

$$\begin{array}{l} t=0 \quad 110t \\ \hline \frac{1}{2} \cdot 85 \quad 85t \\ \hline \end{array}$$

$$110t = \frac{1}{2}(85) + 85t$$

Solve for t

30)



$$x^2 + h^2 = 9$$

Pythagoras

$$(5-x)^2 + h^2 = 16$$

$$x^2 - (5-x)^2 + \cancel{h^2} - \cancel{h^2} = 9 - 16$$

$$x^2 - (25 - 10x + x^2) = -7$$

$$\cancel{x^2} - 25 + 10x - \cancel{x^2} = -7$$

$$10x = -7 + 25$$

$$10x = 18$$

$$x = 1.8$$

$$x^2 + h^2 = 9$$

$$(1.8)^2 + h^2 = 9$$

$$h^2 = 9 - (1.8)^2$$

$$h^2 = 5.76$$

$$h = 2.4$$

$$A = \frac{1}{2} (\text{base}) \cdot h$$

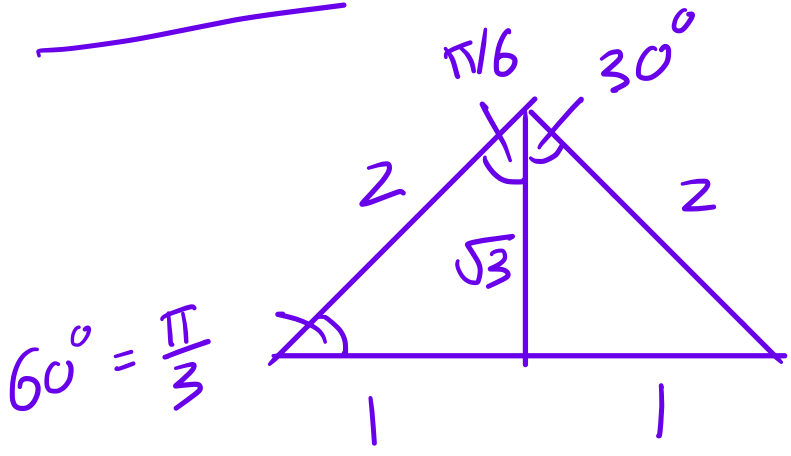
$$= \frac{1}{2} (5)(2.4) = 6 \checkmark$$

$$\frac{10}{10} \frac{5(2.4)}{2} = \frac{12.0}{2} = \textcircled{6}$$

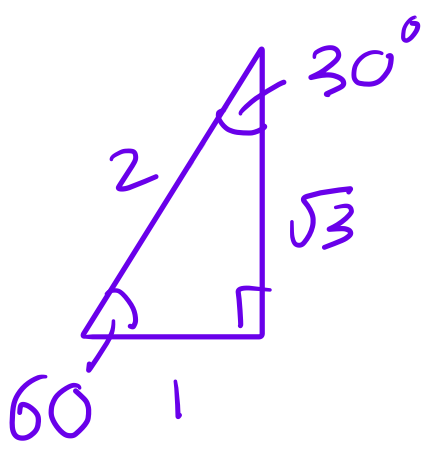
$$\frac{624(8)}{205} = \underline{\underline{6}}$$

$\pi \text{ rad} = 180^\circ$

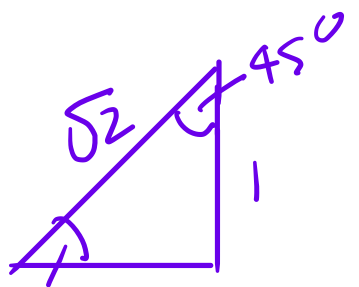
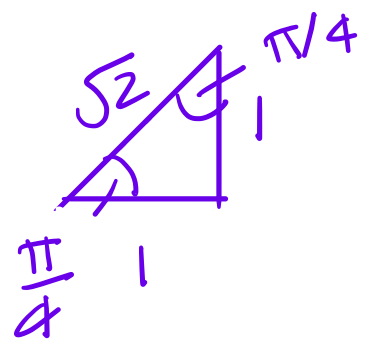
equilateral triangle



$$1^2 + h^2 = 2^2 \quad h^2 = 3 \quad h = \sqrt{3}$$



\* add to notes



450 1

A)  $\sin \frac{7\pi}{6}$

B)  $\cos(\frac{5\pi}{4})$

C)  $\sin(5\pi/6)$

D)  $\cos(11\pi/4)$

E)  $\sin(\frac{3\pi}{4}) =$

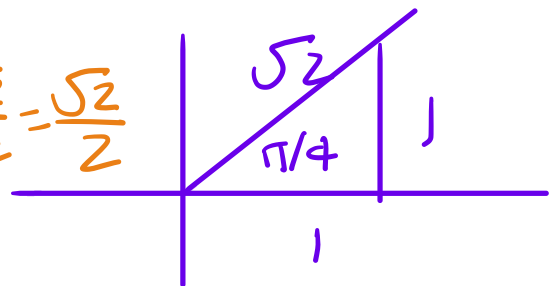
F)  $\cos \frac{11\pi}{6} = \frac{\sqrt{3}}{2}$

G)  $\sin \pi/6 = \frac{1}{2}$

H)  $\cos \pi/3 = \frac{1}{2}$

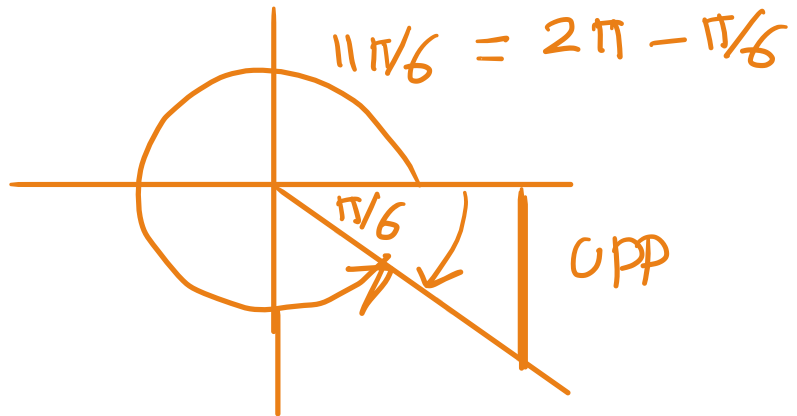
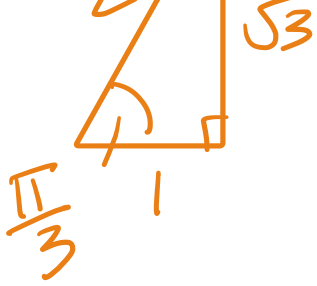
I)  $\sin(\pi/4) = \frac{1}{\sqrt{2}}$

J)  $\cos \pi/4 = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$



2. A  $\pi/6$

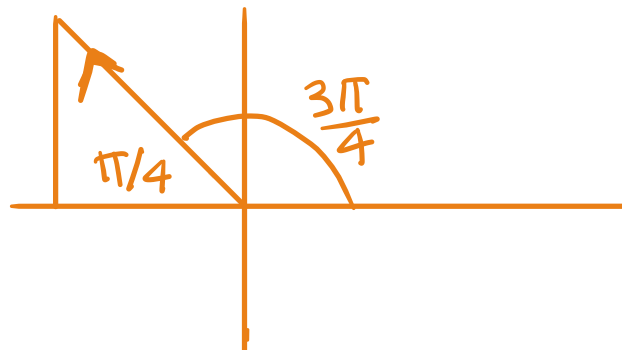
SOHCAHTOA



$$\cos 11\frac{\pi}{6} = +\cos\frac{\pi}{6} = \frac{\sqrt{3}}{2}$$

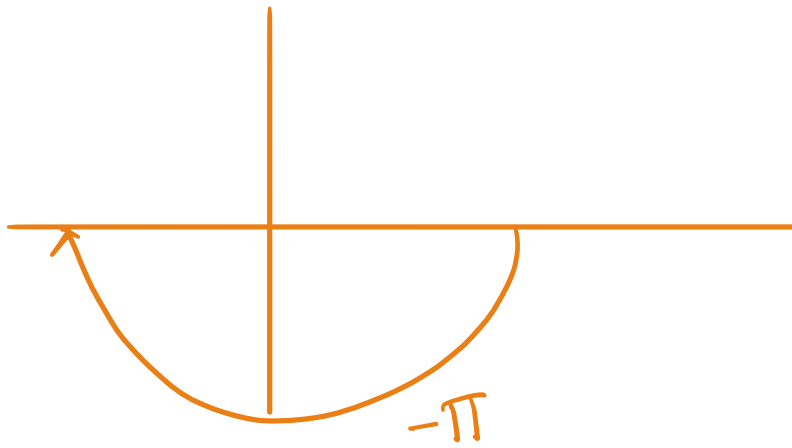
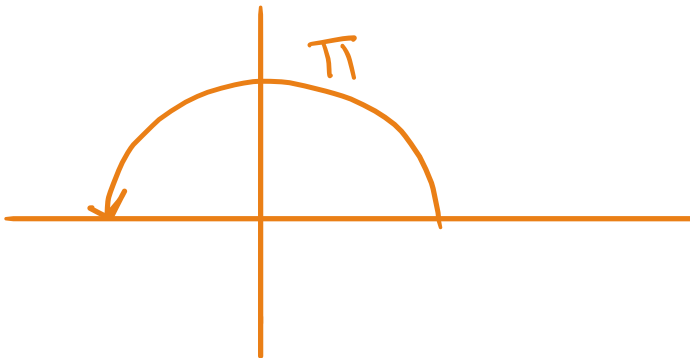
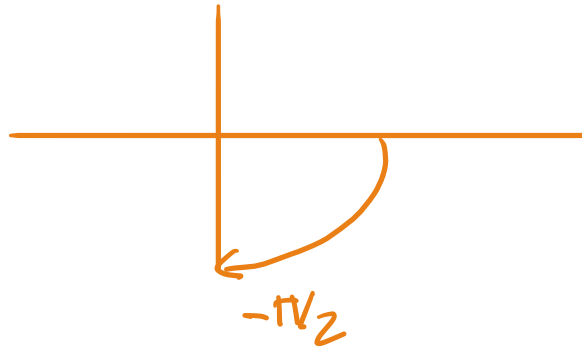
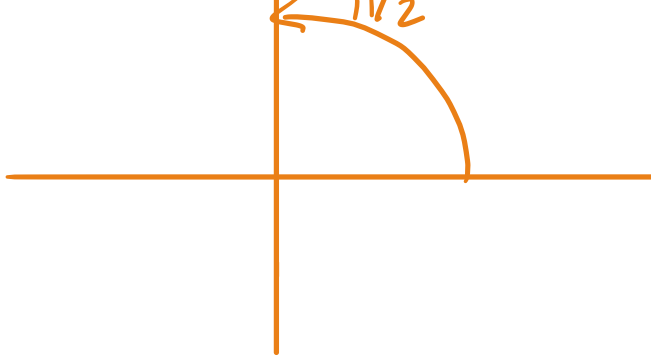
$$\sin 11\frac{\pi}{6} = -\sin\frac{\pi}{6} = -\frac{1}{2}$$

E)  $\sin\left(\frac{3\pi}{4}\right) = \sin\pi/4$   
counter-clockwise



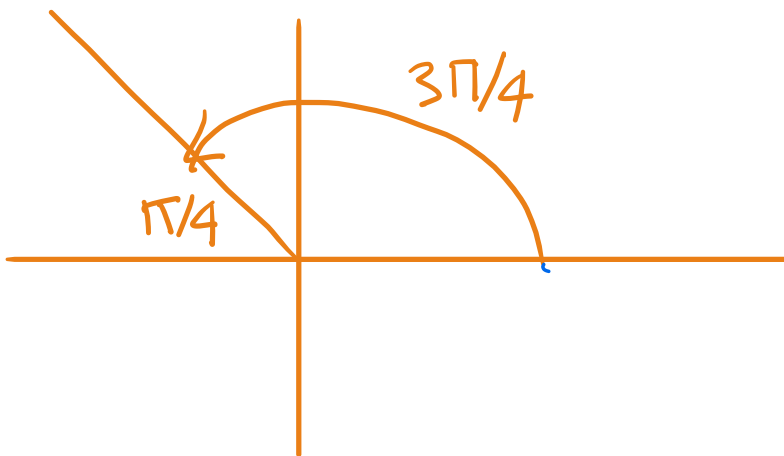
$\pi/2$

$\pi/6$



$\sin > 0$ $\cos < 0$ $\tan < 0$	S	$\sin > 0$ $\cos > 0$ $\tan > 0$	A
$\sin < 0$ $\cos < 0$ $\tan > 0$	T	$\cos > 0$ $\sin < 0$ $\tan < 0$	C

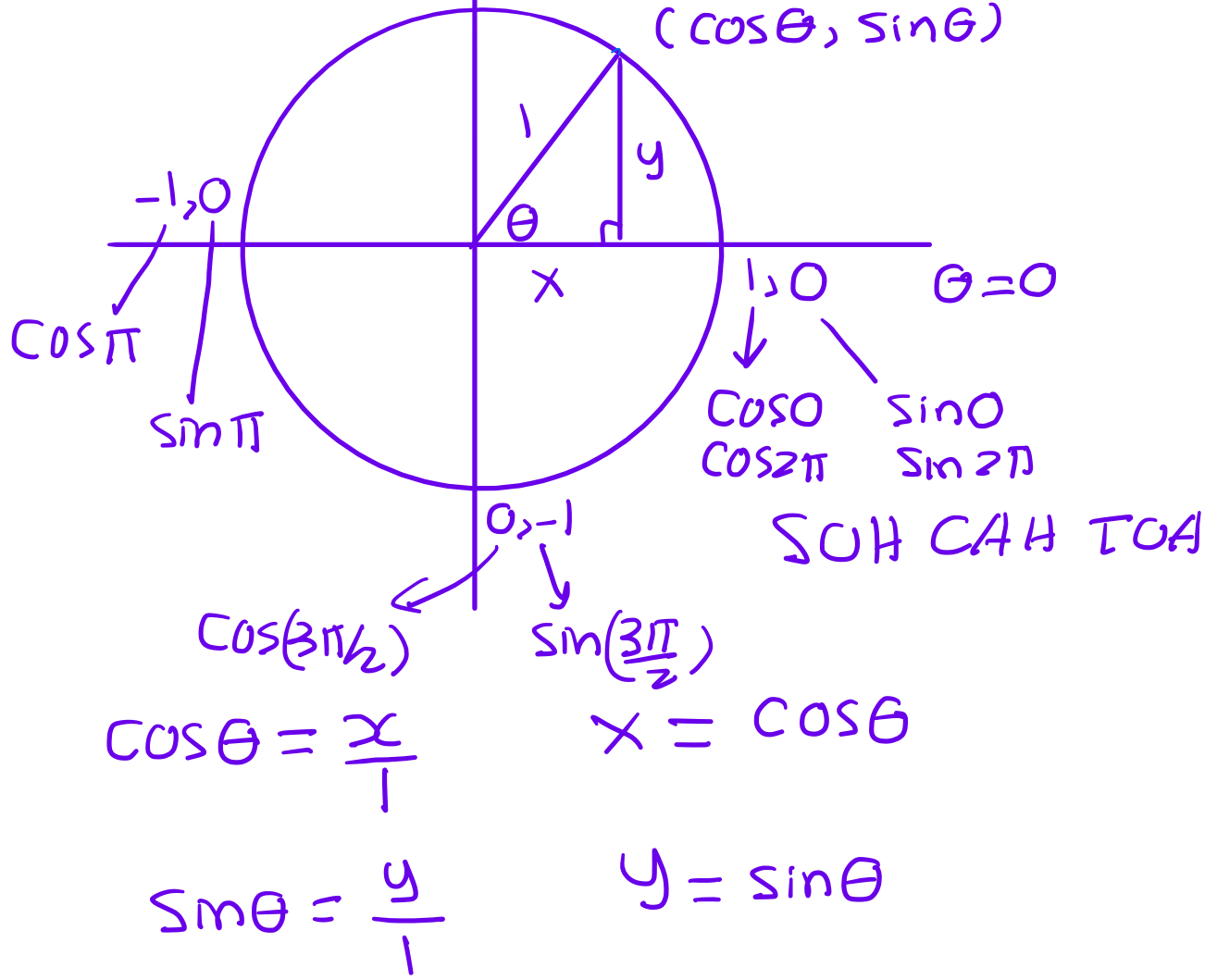
$$\sin\left(\frac{3\pi}{4}\right) = \sin \pi/4 = \underline{\underline{1/\sqrt{2}}}$$



Unit circle

$$|0, 1| \begin{cases} \cos(\pi/2) \\ \sin(\pi/2) \end{cases}$$





$$\pi \text{ rad} = 180^\circ$$

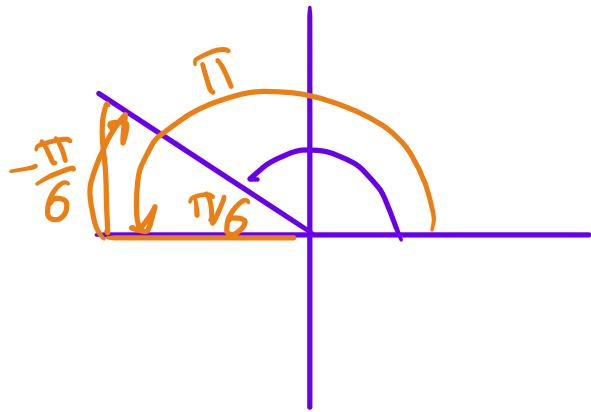
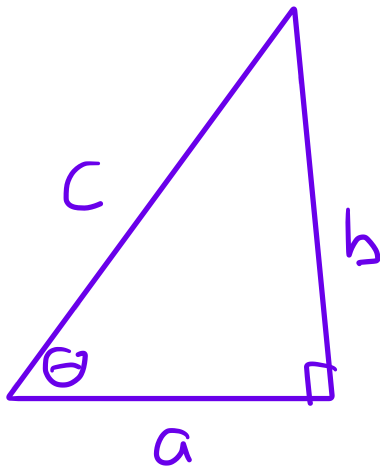
$$\frac{\pi}{2} \text{ rad} = 90^\circ$$

SOH CAH TOA

→ Log. equation videos

→ trig. videos

→ keep working through, cont. 2013



$$\begin{aligned} \sin \theta &= \frac{b}{c} \\ \cos \theta &= \frac{a}{c} \\ \tan \theta &= \frac{b}{a} \end{aligned}$$

$$\frac{5\pi}{6} = \pi - \frac{\pi}{6}$$

$$\cos \frac{5\pi}{6} = -\cos \frac{\pi}{6} = -\frac{\sqrt{3}}{2} = -\frac{\sqrt{3}}{2}$$

$$\cos \frac{5\pi}{6} = -\boxed{\cos \frac{\pi}{6}}$$

