1. Choose the answer that describes the set of all points $P(x,y)$ in a coordinate plane that are in quadrants I and II.

A. $x > 0$

B. $y < 0$

C. $x < 0$

(*D.*) $y > 0$

E. Cannot be determined

2. Express in the form $a + bi$, where a and b are real numbers.

$$\frac{4-i}{3+4i}$$

$$\frac{(4-i)}{(3+4i)}\ \frac{(3-4i)}{(3-4i)} = \frac{12-16i-3i+4i^2}{9-16i^2}$$

$$= \frac{12-19i-4}{9+16}$$

$$= \frac{8-19i}{25}$$

A. $-\frac{16}{7}+\frac{19}{7}i$

(*B.*) $\frac{8}{25}-\frac{19}{25}i$

C. $16+13i$

D. $-\frac{8}{7}+\frac{19}{7}i$

E. $\frac{4}{3}-\frac{1}{4}i$

3. Solve the following inequality. Express your answer in interval notation.

$$|3x+5| \geq 9$$

$3x+5 \leq -9$ *or* $3x+5 \geq 9$

$3x \leq -14$ *or* $3x \geq 4$

$x \leq -\frac{14}{3}$ *or* $x \geq \frac{4}{3}$

A. $\left(-\infty, -\frac{4}{3}\right] \cup \left[\frac{4}{3}, \infty\right)$

B. $\left[-\frac{14}{3}, \frac{4}{3}\right]$

(*C.*) $\left(-\infty, -\frac{14}{3}\right] \cup \left[\frac{4}{3}, \infty\right)$

D. $\left[\frac{4}{3}, \infty\right)$

E. None of the above

4. Find the distance between the points $(4,-3)$ and $(2,5)$. Simplify your answer.

$$d(A,B)=\sqrt{(2-4)^2+(5-(-3))^2}$$
$$=\sqrt{(-2)^2+(8)^2}=\sqrt{4+64}=\sqrt{68}$$
$$=\sqrt{4\ \ 17}=2\sqrt{17}$$

A. $2\sqrt{17}$

B. $\sqrt{6}$

C. $2\sqrt{10}$

D. 10

E. $2\sqrt{2}$

5. Find all solutions of the following equation. Simplify your answer as much as possible.

$$x(x+10)=5$$
$$x^2+10x-5=0$$
$$x=\frac{-10\pm\sqrt{10^2-4(1)(-5)}}{2(1)}=\frac{-10\pm\sqrt{100+20}}{2}$$
$$=\frac{-10\pm\sqrt{120}}{2}=\frac{-10\pm\sqrt{4\ \ 30}}{2}=\frac{-10\pm2\sqrt{30}}{2}$$
$$=\frac{-10}{2}\pm\frac{2\sqrt{30}}{2}=-5\pm\sqrt{30}$$

A. $x=-5\pm2\sqrt{30}$

B. $x=-5\pm\sqrt{15}$

C. $x=-5\pm2\sqrt{5}$

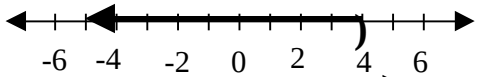
D. $x=-5\pm\sqrt{30}$

E. $x=-5, x=5$

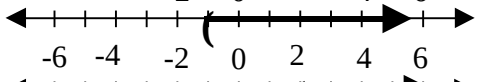
6. Solve the following inequality for x. Choose the graph that depicts the correct solution.

$$\frac{1}{3}(x+6)<\frac{5}{6}(2x-4)$$
$$\frac{1}{3}x+2<\frac{5}{3}x-\frac{10}{3}$$
$$3\left(\frac{1}{3}x+2\right)<3\left(\frac{5}{3}x-\frac{10}{3}\right)$$
$$x+6<5x-10$$
$16<4x$ so $4<x$ means $x>4$

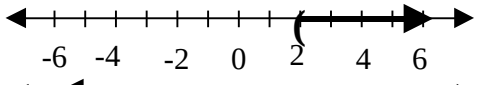
A.



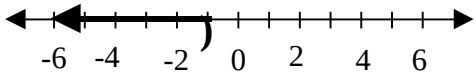
B.

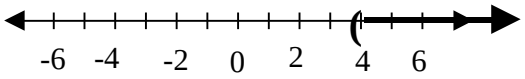


C.



D.





(E.) None of the above

7. Find the center and the radius of the circle given by the equation

$$x^2 - 8x + y^2 + 6y + 11 = 0$$

$x^2 - 8x + \_\_\_ + y^2 + 6y + \_\_\_ = -11 + \_\_\_ + \_\_\_$

$x^2 - 8x + \underline{16} + y^2 + 6y + \underline{9} = -11 + \underline{16} + \underline{9}$

$(x-4)^2 + (y+3)^2 = 14$

A. $(-4,3);\ r = 14$

B. $(-4,3);\ r = \sqrt{14}$

(*C.*) $(4,-3);\ r = \sqrt{14}$

D. $(4,-3);\ r = 14$

E. None of the above

8. Find all real and complex solution(s) of the equation

$$4x^4 - 35x^2 - 9 = 0$$

$(4x^2 + 1)(x^2 - 9) = 0$

$4x^2 + 1 = 0,\ x^2 - 9 = 0$

$x^2 = -\frac{1}{4},\ x^2 = 9$

$x = \pm\sqrt{\frac{-1}{4}},\ x = \pm\sqrt{9}$

$x = \pm\frac{1}{2}i,\ x = \pm 3$

(*A.*) $x = \pm\frac{1}{2}i,\ \pm 3$

B. $x = \pm\sqrt{22},\ \pm 3$

C. $x = \pm\frac{3}{2}i,\ \pm\frac{41}{2}$

D. $x = \pm\sqrt{11},\ \pm 3$

E. None of the above

9. Solve the following inequality for x. Express your answer in interval notation.

$$\frac{(x+2)(x-3)}{x-5} < 0$$

$\frac{(x+2)(x-3)}{x-5} = 0$ when $x = -2, x = 3$

Also, $x \neq 5$

		-2	3	5
$x+2$	-	+	+	+
$x-3$	-	-	+	+
$x-5$	-	-	-	+
Result	-	+	-	+

A. $(-2,3)$ $(5,\infty)$

B. $(-\infty,-2)$ $(3,5)$

C. $(-2,3)$ $(3,5)$ $(5,\infty)$

D. $(-\infty,-2)$ $(3,\infty)$

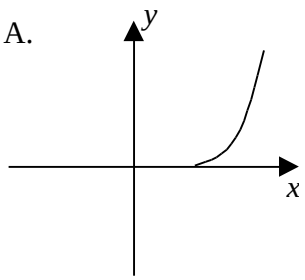
E. None of the above

10. Which of the following depicts the graph of the equation

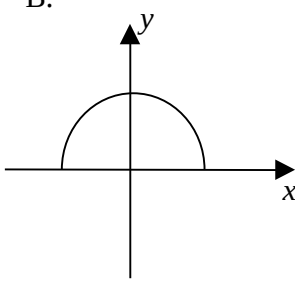
$$y=\sqrt{x-3}$$

x	y
2	Not real
3	0
4	1
7	2

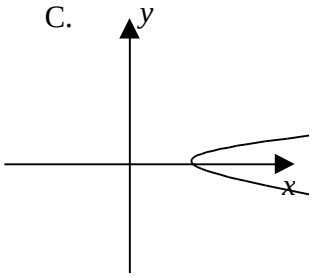
A.



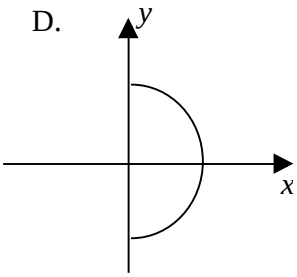
B.



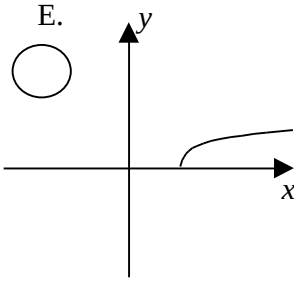
C.



D.



E.



11. Solve for x. Check your answer(s). Choose the letter that best describes the solution(s).

$$\sqrt{5x+19} = x+1$$

$\left(\sqrt{5x+19}\right)^2 = (x+1)^2$

$5x+19 = x^2+2x+1$

$0 = x^2-3x-18$

$(x-6)(x+3) = 0$

$x = 6,\ x = -3$ but $x = -3$ is extraneous

A. There are two solutions; they are both positive

B. There are two solutions; one is postive and one is negative

(*C.*) There is one solution; it is greater than 5

D. There is one solution; it is less than -2

E. None of the above

12. Smalltown and Big City are 689 miles apart along a straight highway. Rachel left Smalltown at 8:30 a.m. traveling towards Big City at a rate of 70 mph. Scott left Big City at 10:00 a.m. traveling towards Smalltown at a rate of 76 mph. At what time will Rachel and Scott meet each other on the highway?

let t=# hours past 8:30 a.m.

$70t + 76(t-1.5) = 689$

$70t + 76t - 114 = 689$

$146t = 803$

$t = 5.5$

5.5 hours past 8:30 a.m. is 2:00 p.m.

A. 12:24 p.m.

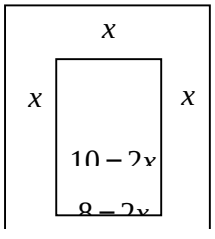
(B.) 2:00 p.m.

C. 1:12 p.m.

D. 3:30 p.m.

E. None of the above

13. A rectangular picture has an area of 50 square inches. The picture is surrounded by a border of uniform width. The outer dimensions (picture with the border) are 8 inches by 10 inches. If the variable x represents the width of the border, find the equation that would be used to find x. Do not solve the equation. Simplify the equation. (Hint: Draw and label a picture.)



$(10-2x)(8-2x) = 50$

$80-20x-16x+4x^2 = 50$

$4x^2-36x+30 = 0$

$2x^2-18x+15 = 0$

A. $x^2 - 18x + 50 = 0$

B. $x^2 + 18x + 50 = 0$

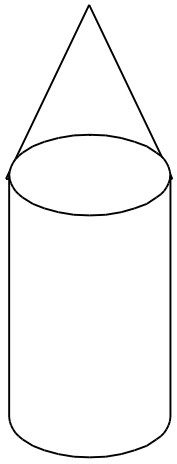
C. $x^2 - 18x + 30 = 0$

(*D.*) $2x^2 - 18x + 15 = 0$

E. $2x^2 + 18x + 25 = 0$

8

14. Shown below is a right circular cylinder with diameter 30 cm topped by a right circular cone. The height of the cone is 10 cm less that the height of the cylinder. Find the height of the cylinder if the total volume of the object is to be $12{,}750\pi\ \text{cm}^3$. (Volume of a right circular cylinder $= \pi r^2 h$ and volume of a right circular cone $= \frac{1}{3}\pi r^2 h$.)



$\text{Vol.}_{\text{cone}} + \text{Vol.}_{\text{cylinder}} = 12750\pi$

$\frac{1}{3}\pi(15)^2(h-10) + \pi(15)^2 h = 12750\pi$

$75\pi(h-10) + 225\pi h = 12750\pi$

$75\pi[h - 10 + 3h] = 12750\pi$

$h - 10 + 3h = 170$

$4h = 180$

$h = 45$

A. $\frac{85}{2}\,cm$

B. $50\,cm$

(*C.*) $45\,cm$

D. $\frac{145}{8}\,cm$

E. None of the above