King Fahd University of Petroleum and Minerals
Mathematical Sciences Department

Instructor: Al-Absi, Bassam

Student's Name:......KEY............................ **ID:** ....**SEC:**...

Important Instructions: (1) **Show All Necessary Steps**
(2) **Grading will be Based on Every Step**
(3) **Unverified Final Answers will not be Graded**

(1) The radius R and the center C of the circle $2x^2+2y^2+12x+16y-22=0$ are:

a) $R=6$ and $C=(-3,\ -4)$ ✓
b) $R=36$ and $C=(3,\ 4)$
c) $R=\sqrt{6}$ and $C=(-3,\ -4)$
d) $R=36$ and $C=(-3,\ -4)$
e) $R=6$ and $C=(-4,\ -3)$

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

$(x^2+6x+9)+(y^2+8y+16)=11+9+16$

$(x-(-3))^2+(y-(-4))^2=36$

---

(2) An equation of a circle that has a diameter with endpoints $(2,3)$ and $(-4,11)$ is:

a) $(x+2)^2+(y-3)^2=4$
b) $(x-1)^2+(y+7)^2=25$
c) $(x+3)^2+(y-3)^2=4$
d) $(x+1)^2+(y-7)^2=25$ ✓
e) $(x+7)^2+(y-3)^2=4$

The diameter $=\sqrt{(11-3)^2+(-4-2)^2}=10$

The center $=$ Midpoint $=\left(\frac{-4+2}{2},\ \frac{11+3}{2}\right)=\boxed{(-1,7)}$

The radius $=\frac{1}{2}\cdot 10=\boxed{5}$

---

(3) If (a,b) is the vertex and Max is the maximum value of the function $y=-2x^2+4x-4$, then:

a) $a+b=0$, $Max=-1$
b) $a+b=-1$, $Max=-2$ ✓
c) $a+b=-3$, $Max=-1$
d) $a+b=-1$, $Max=-3$
e) $a+b=-1$, Max does not exist.

Rewriting the equation in standard form,

$$\left.\begin{aligned} h&=\frac{-4}{2(-2)}=1 \\ k&=f(1)=-2+4-4=-2 \end{aligned}\right\}\ \text{Vertex}=\boxed{(1,-2)}$$

the eq. represend a downward open parabola.

$\Rightarrow Max.=K=\boxed{-2}$

4) The graph of the equation $3x^2 = |2x - 5y|$ is symmetric with respect to:

a) the y-axis and origin
b) the x-axis only
c) the y-axis only
d) the origin only
e) the x-axis, the y-axis, and the origin

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

$3x^2 = |-2x + 5y|$

$\Rightarrow 3x^2 = |-(2x - 5y)| = |2x - 5y|$

$\Rightarrow 3x^2 = |2x - 5y|$

---

5) The x-intercept of the line that is passing through the point $(2,-1)$ and parallel to the line $3x + 4y = 5$ is :

a) $\left(\frac{-1}{3}, 0\right)$
b) $\left(\frac{2}{3}, 0\right)$
c) $(4,0)$
d) $(-3,0)$
e) $\left(0, \frac{2}{3}\right)$

the slope m_2 of

$\Rightarrow$ m_1 of the through $(2,-1)$ is $\frac{-3}{4}$ also

$\Rightarrow$ the eq. is $y + 1 = \frac{-3}{4}(x - 2)$

$\Rightarrow$ the x-intercept is : $0 + 1 = \frac{-3}{4}(x - 2)$

$\Rightarrow x - 2 = \frac{-4}{3}$

$\Rightarrow x = \frac{2}{3}$

---

6) Which one of the following relations defines y as a function of x ?

a) $y^2 + 3x = 3$
b) $\{(2,3),(3,5),(4,6),(5,3),(4,10)\}$
c) $x^2 + y^2 = 9$
d) $|y| = |x| + 5$ if $y < 0$ $\because$ since $y = -(5 - |x|)$ only.
e) $y = 4 \pm \sqrt{x}$

---

(7) If $f(x)=\begin{cases} [\![1-2x]\!] & \text{if } 0 \le x \le 5 \\ 5 & \text{if } 5 < x \le 8 \\ \sqrt{x-7} & \text{if } 8 < x \le 11 \end{cases}$, then for $1 < n \le 2$, $f(1.2)+f(8)+f(n^2+7)=$

a) 0

b) 3

c) $-n+3$

✓ d) $n+3$

e) $n+4$

$f(1.2) = [\![1-2(1.2)]\!] = [\![-1.2]\!] = -2.$

$f(8) = 5.$

$f(n^2+7) = \sqrt{n^2+7-7} = |n| = n$ as $1 < n \le 2$

$\Rightarrow$ the sum is $-2+5+n = n+3$

---

(8) The graph of the function $f(x)=\begin{cases} 2 & \text{if } x<-2 \\ |x|+1 & \text{if } -2 \le x < 3 \\ 3-x & \text{if } x \ge 3 \end{cases}$

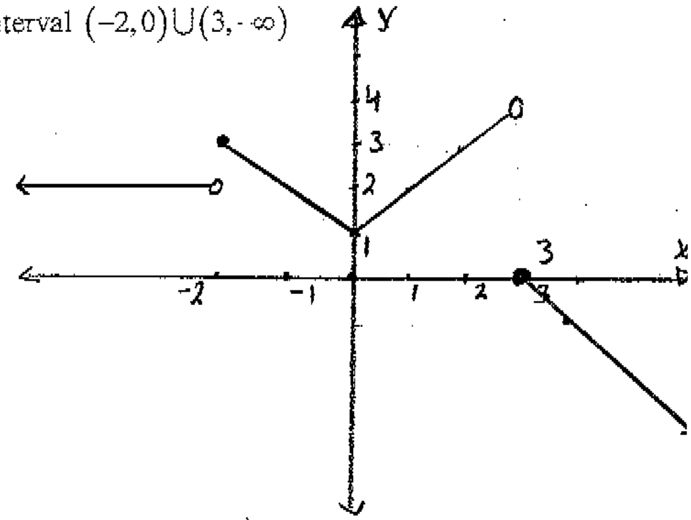
a) is decreasing over the interval $(-\infty,3)$

b) has no x-intercept and has the y-intercept $y=1$

✓ c) has range $(-\infty,0]\cup[1,4)$ and is decreasing over the interval $(-2,0)\cup(3,\infty)$

d) is increasing over $(0,\infty)$

See the below graph



---

(9) If the slope of the line passing through a point P on the x-axis and the point $(-1,3)$ is $\frac{3}{2}$, then

a) P is $(3,0)$

✓ b) P is $(-3,0)$

c) P is $(0,-3)$

d) P is $(0,0)$

Let the point be. $(x,0)$

$\Rightarrow \dfrac{3-0}{-1-x} = \dfrac{3}{2}$

$\Rightarrow -3x-3=6$

$\Rightarrow x=-3$