1) Which is an equation for an asymptote for the equation $9x^2 - 16y^2 = 144$?

a) $y = \frac{4}{3}x$

b) $y = -\frac{3}{4}x$

c) $y = -\frac{3}{5}x$

d) $y = -\frac{5}{4}x$

e) $y = \frac{5}{3}x$

2) The population of a town in 1980 was 125,500. The population of the same town in 2000 was 155,000. Assuming that the growth rate between 1980 and 2000 continues, what year can it be predicted that the town's population will be 200,000?

a) 2021
b) 2024
c) 2027
d) 2030
e) 2033

or

3) Which is the solution for $\sqrt{3x-2} = \sqrt{x-1} + 3$?

a) 6
b) 9
c) 17
d) 34
e) 41

4) Which is the period of $f(x) = -3\sin\frac{2}{3}(x-45°)$ ?

a) 3
b) $\frac{2}{3}$
c) 45°
d) 240°
e) 540°

**In this problem:**

5) Which is the phase shift for $y = -2 + \frac{3}{2}\sin(3x - 90°)$ ?

a) down 2
b) up 2
c) to the right 90°
d) to the left 90°
e) to the right 30°

6) Which is the center of a circle whose equation is $x^2 + y^2 + 6x - 10y - 15 = 0$ ?

a) $(6, -10)$
b) $(-6, 10)$
c) $(3, -5)$
d) $(-3, 5)$
e) $(0, 7)$

7) What is the value when $(3+2i)^3$ is expanded?

a) $(27+8i)$
b) $(-9+46i)$
c) $(-9-6i)$
d) $(63+59i)$
e) $(27+8i)$

8) In triangle *KLM*, $k$ = 3.5, $l$ = 4.5, and $m$ = 6.5. Which is the measure of angle *M* to the nearest degree?

a) 18°
b) 72°
c) 108°
d) 162°
e) no value—no such triangle can exist

9) Which is the solution for a in $\sqrt{2a+5}-2\sqrt{2a}=1$?

a) 2

b) $\frac{2}{3}$

c) $\frac{2}{9}$

d) $-\frac{2}{3}$

e) $-\frac{2}{9}$

10) Which is the equation for a hyperbola having foci $(4,0)$ and $(-4,0)$ and having one vertex at $(3,0)$?

a) $\frac{x^2}{9}-\frac{y^2}{7}=1$

b) $\frac{x^2}{7}-\frac{y^2}{9}=1$

c) $\frac{y^2}{9}-\frac{x^2}{7}=1$

d) $\frac{y^2}{7}-\frac{x^2}{9}=1$

e) $\frac{x^2}{16}-\frac{y^2}{7}=1$

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**CLEP Precalculus Practice Question Answer Key**

1) The answer is B. Rewrite conic equation in standard form by dividing each term by 144 to obtain $\frac{x^2}{16}-\frac{y^2}{9}=1$. Thus a = 4 and b = 3, the square roots of the denominators. This equation represents a hyperbola. The equation for the asymptotes of a hyperbola is $y=\pm\frac{b}{a}$x, or $y=\pm\frac{3}{4}x$. One of these equation is $y=-\frac{3}{4}x$.

2) The answer is B. Using the exponential growth model $A(t)=A(0)e^{rt}$, where $A(t)$ is the population at time $t$ years after the original population was recorded, $A(0)$ is the original population, $r$ is the rate of growth, and $t$ is the time between the original population and the new population. For the first part of the problem, we know that $A(t)$ = 155,000, $A(0)$ = 125,500, and $t$ = 20. We must now find $r$: $155{,}000 = 125{,}500e^{r\times 20}$, or $1.235 = e^{20r}$. Take the natural log of both sides of the equation to obtain $\ln(1.235)=20r$ (remember that $\ln e^x = x$), or $r$ = 0.0106. Now use this value to find $t$ when $A(t)$ = 200,000: $200{,}000 = 125{,}500e^{0.0106t}$, or $1.594=e^{0.0106t}$. Take the natural log of both sides of this equation to obtain $\ln 1.594 = 0.0106t$. Then solving for $t$ yields $t$ = 43.99 years, or approximately 44 years from the original year, or 1980 + 44 = 2024.

3) The answer is C. To solve a radical equation, first isolate one of the radicals: $\sqrt{3x-2}=\sqrt{x-1}+3$. Now square both sides of the equation to obtain $3x-2=x-1+6\sqrt{x-1}+9$. (Note when squaring the right side of this equation, the result is not equal to just squaring each term, that is $(a+b)^2\neq a^2+b^2$). Gather like terms to obtain $2x-10=6\sqrt{x-1}$, divide each term by 2: $x-5=3\sqrt{x-1}$, then square each side: $x^2-10x+25=9x-9$, or $x^2-19x+34=0$. Now factor the quadratic to obtain $(x-17)(x-2)=0$, which yields $x=17$ or $x=2$. However, when using the squaring property (squaring both sides of the equation), it is possible that one or both of these solutions is extraneous or does not fit the original problem. Using $x=17$ in the original equation yields 7 = 4 + 3, which is correct. Substituting $x=2$ yields 2 = 1 + 3, which is incorrect. Only $x=17$ is a solution.

4) The answer is E. The frequency of a sine function in the form $f(x) = a\sin b(x+\theta)$ is $b$. The relationship between frequency and period in a sine (or cosine) function is $f \cdot P = 360°$ . In this problem, $f = \frac{2}{3}$, so $\frac{2}{3} \cdot P = 360°$, or $P = 540°$.

5) The answer is E. To find the phase shift for a trig function, first factor the coefficient of the independent variable, in this case $3x - 90°$ to $3(x - 30°)$. The value $-30°$ is the phase shift, with the negative value meaning a shift to the right.

6) The answer is D. To find the center of the a circle whose equation is $x^2 + y^2 + 6x - 10y - 15 = 0$, gather like variables in the following manner: $x^2 + 6x + \_ + y^2 - 10y + \_ = 15$, where the blanks need to be filled in. To fill in the blanks you will need to complete the square for the $x$ terms and for the $y$ terms. For $x^2 + 6x + \_$ , halve 6 to obtain 3, then square the three to obtain 9. That is the number to be placed in the blank. However, if you add 9 to the left side of this equation, it is required to add 9 to the right side as well or $x^2 + 6x + 9 + y^2 - 10y + \_ = 15 + 9$. Now complete the square for the $y$ terms: $y^2 - 10y + \_$ by taking half of $-10$ or $-5$, squaring to obtain 25, which is now added to both sides of the equation: $x^2 + 6x + 9 + y^2 - 10y + 25 = 15 + 9 + 25$. The $x$ terms can now be written as a perfect square or $(x+3)^2$. Note that +3 is half the value of the coefficient of the term $6x$. Similarly the $y$ terms can be written as $(y-5)^2$. Our equation can be written as $(x+3)^2 + (y-5)^2 = 49$, where $(x-h)^2 + (y-k)^2 = r^2$ is the general equation for a circle whose center is $(h,k)$—the opposite values of the numbers in the parenthesis—and $r$ is the radius. In this case $(h,k)$ is $(-3,5)$.

7) The answer is B. $(3+2i)^3 = (3+2i)(3+2i)(3+2i)$ First multiply the first two factors or $(3+2i)(3+2i) = (9+6i+6i+4i^2)$ or $(5+12i)$, since $4i^2 = 4(-1)$ or -4 Now multiply $(5+12i)$ $(3+2i)$ or $(15+10i+36i+24i^2)$, which combines to $(-9+46i)$

8) The answer is $C$. When given three sides of a triangle and an angle is required to be known, use the law of cosines: $m^2 = k^2 + l^2 - 2kl\cos M$, where $M$ is the angle that is sought.
Substituting: $(6.5)^2 = (3.5)^2 + (4.5)^2 - 2(3.5)(4.5)\cos M$ or

$42.25 = 12.25 + 20.25 - 31.5\cos M$ Gathering like terms yields:

$9.75 = -31.5\cos M$ or $\cos M = -0.3095$. Finally, take the inverse cosine or $\cos^{-1}(-.3095) = M$ or $M = 108°$.

9) The answer is C. Isolate the first radical: $\sqrt{2a+5} = 2\sqrt{2a} + 1$, then square both sides: $2a+5 = 8a + 4\sqrt{2a} + 1$, then isolate this radical to obtain: $4 - 6a = 4\sqrt{2a}$, then divide both sides by 2: $2 - 3a = 2\sqrt{2a}$. Now square both sides: $4 - 12a + 9a^2 = 8a$ or $9a^2 - 20a + 4 = 0$. Factor: $(9a-2)(a-2) = 0$ or $a = \frac{2}{9}$ or $a = 2$. When squaring both sides of the equation,it is necessary to check both results:

$\sqrt{2\frac{2}{9}+5} - 2\sqrt{2\frac{2}{9}} = 1?$ $\sqrt{2\cdot 2+5} - 2\sqrt{2\cdot 2} = 1$

$\sqrt{\frac{49}{9}} - 2\cdot\frac{2}{3} = 1?$ $\sqrt{9} - 2\sqrt{4} = 1$

1 = 1, which is correct -1 = 1, which is NOT correct

$a = \frac{2}{9}$ is the only correct answer.

10) The answer is A. The center of the hyperbola is $(0, 0)$ halfway between the two foci. The focal length is therefore 4, which is the value $c$. The hyperbola crosses the $x$-axis at its vertex. The distance from the center to the vertex is 3, which is the value $a$. In a hyperbola the relationship $b^2 = c^2 - a^2$ or $b^2 = (4)^2 - (3)^2$ with $b^2 = 7$. The general equation for a hyperbola crossing the $x$-axis is $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ or in this case: $\frac{x^2}{9} - \frac{y^2}{7} = 1$