Name _____ **Date** _____ **Period** _____

Pre-Calculus Unit 2 Practice Test—Answers

1. Solve $4(x-3)^2+5=-25$ using the square root method.

$$4(x-3)^2=-30$$
$$(x-3)^2=-\frac{30}{4}$$
$$x-3=\pm\sqrt{-\frac{30}{4}}$$
$$x-3=\pm\frac{\sqrt{30}}{2}i$$
$$x=3\pm\frac{\sqrt{30}}{2}i$$

2. Solve $8x^2-14x=15$ by factoring.

$$8x^2-14x-15=0$$
$$8x^2-20x+6x-15=0$$
$$4x(2x-5)+3(2x-5)=0$$
$$(2x-5)(4x+3)=0$$
$$x=\frac{5}{2}\text{ and }x=-\frac{3}{4}$$

3. Solve $x^2-6x+4=0$ by completing the square.

$$x^2-6x=-4$$
$$(x-3)^2=-4+(3)^2$$
$$(x-3)^2=-4+9$$
$$(x-3)^2=5$$
$$x-3=\pm\sqrt{5}$$
$$x=3\pm\sqrt{5}$$

4. Solve $2x^2-3x+5$ using the quadratic formula.

$$\frac{3\pm\sqrt{(-3)^2-4(2)(5)}}{2(2)}=\frac{3\pm\sqrt{-31}}{4}=\frac{3\pm i\sqrt{31}}{4}$$

5. Find the exact solution using any method $6x^2+2x+3=1$.

$$6x^2+2x+2=0$$

$$\frac{-2\pm\sqrt{(2)^2-4(6)(2)}}{2(6)}=\frac{-2\pm\sqrt{-44}}{12}=\frac{-2\pm2i\sqrt{11}}{12}=\frac{-1\pm i\sqrt{11}}{6}$$

6. What is the fundamental theorem of Algebra?

For a polynomial of degree n there are n real zeros.

7. Use your calculator to find the approximate solutions to the equation $2x^4 - 3x^3 + 2 = 0$.

There are no real zeros because it doesn't cross the x-axis.

Are there any complex solutions to this equation (you don't need to find them if there are)? If so, how many? Explain how you know.

There are 4 complex solutions because there are no real zeros and it is a 4th degree polynomial.

Solve the equations. You may use your calculator (to start), synthetic division, factoring, or the quadratic formula. Leave answers as exact answers in simplified form.

8. $x^4 - 4x^2 + 3 = 0$

$$\begin{array}{r|rrrrr} 1| & 1 & 0 & -4 & 0 & 3 \\ & & 1 & 1 & -3 & -3 \\ \hline -1| & 1 & 1 & -3 & -3 & 0 \\ & & -1 & 0 & 3 & \\ \hline & 1 & 0 & -3 & 0 & \end{array}$$

$x^2 - 3 = 0$

$x^2 = 3$

$x^2 = 3$

$x = \pm\sqrt{3}$

Zeros: $-1, 1, \sqrt{3}, -\sqrt{3}$

9. $x^4 - 81 = 0$

$$\begin{array}{r|rrrrr} 3| & 1 & 0 & 0 & 0 & -81 \\ & & 3 & 9 & 27 & 81 \\ \hline -3| & 1 & 3 & 9 & 27 & 0 \\ & & -3 & 0 & -27 & \\ \hline & 1 & 0 & 9 & 0 & \end{array}$$

$x^2 + 9 = 0$

$x^2 = -9$

$x^2 = -9$

$x = \pm 3i$

Zeros: $-3, 3, 3i, -3i$

10. $x^4 + 5x^3 + x^2 + 5x = 0$

$$\begin{array}{r|rrrrr} -5| & 1 & 5 & 1 & 5 & 0 \\ & & -5 & 0 & -5 & 0 \\ \hline 0| & 1 & 0 & 1 & 0 & 0 \\ & & 0 & 0 & 0 & \\ \hline & 1 & 0 & 1 & 0 & \end{array}$$

$x^2 + 1 = 0$

$x^2 = -1$

$x^2 = -1$

$x = \pm i$

Zeros: $-5, 0, i, -i$

No Calculator Section

11. State the degree, number of possible real zeros, and turning points of the function. Then determine all of the real zeros by factoring.

$$f(x) = 2x^2 - 5x - 3$$

Degree: 2

Possible real zeros: 2

Possible turning points: 1

$$2x^2 - 5x - 3 = 0$$
$$2x^2 - 6x + x - 3 = 0$$
$$2x(x-3) + 1(x-3) = 0$$
$$(x-3)(2x+1) = 0$$
$$x = 3 \text{ and } x = -\frac{1}{2}$$

12. Write the function $f(x) = 3x^4 + 11x^2 - 4$ in completely factored form.

$$3x^4 + 12x^2 - x^2 - 4$$
$$3x^2(x^2+4) - 1(x^2+4)$$
$$(x^2+4)(3x^2-1)$$

13. Sketch a complete graph of the function $f(x)$ in #11. List the coordinates of the y-intercept and zeros.

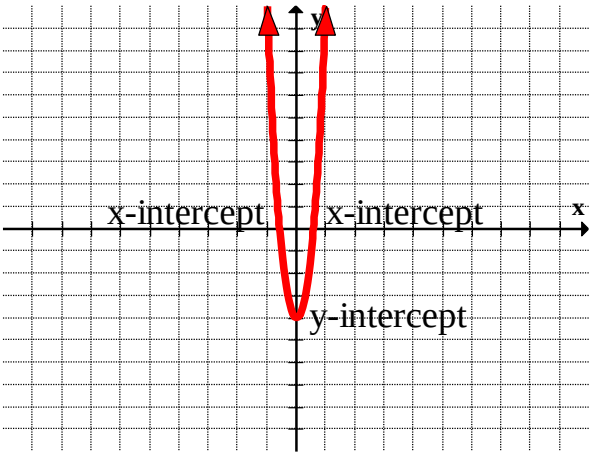
x-intercepts: $(x^2+4)(3x^2-1) = 0$

$$x^2 + 4 = 0$$
$$x^2 = -4$$
$$x = \pm 2i$$
$$3x^2 - 1 = 0$$
$$3x^2 = 1$$
$$x^2 = \frac{1}{3}$$
$$x = \pm\sqrt{\frac{1}{3}}$$

y-intercept: $(0^2+4)(3(0)^2-1)$

$$(4)(-1) = -4$$

zeros: $\pm\sqrt{\frac{1}{3}}$

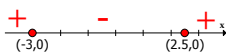


14. Solve the following inequality.

$2x^2 + x - 10 < 5$

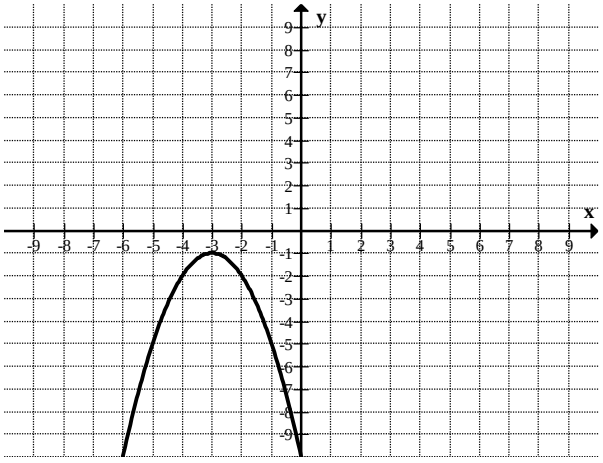
$$2x^2 + x - 15 < 0$$
$$2x^2 + 6x - 5x - 15 < 0$$
$$2x(x+3) - 5(x+3) < 0$$
$$(x+3)(2x-5) < 0$$

$x = -3$ and $x = 2.5$



Solution: $(-3, 2.5)$

15. Write a function for the graph below in vertex form and standard form.



$$y = -(x+3)^2 - 1$$

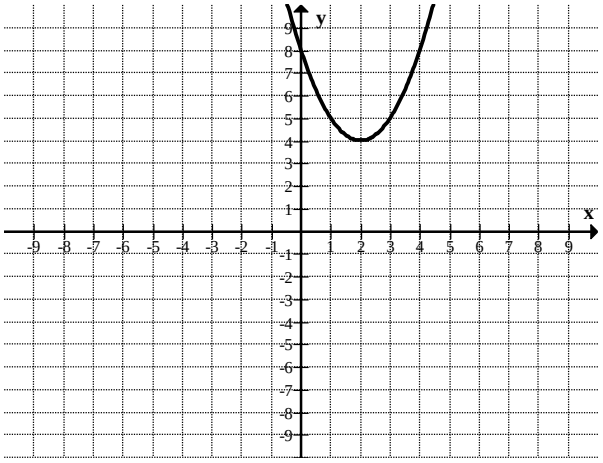
$$y = -(x+3)(x+3) - 1$$

$$y = -\left(x^2 + 6x + 9\right) - 1$$

$$y = -x^2 - 6x - 9 - 1$$

$$y = -x^2 - 6x - 10$$

16. Write a function for the graph below in vertex form and standard form.



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

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

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

$$y = x^2 - 4x + 8$$

17. Write $f(x) = x^2 + 2x - 3$ in vertex form. Identify the vertex of $f(x)$, the max/min value, and the axis of symmetry.

$$-\frac{2}{2(1)} = -1$$

$$f(-1) = 1 - 2 - 3 = -4$$

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

Vertex: $(-1, -4)$ **Min @** $(-1, -4)$

Axis: $x = -1$

18. Write $f(x) = -x^2 - x + 6.5$ in vertex form. Identify the vertex of $f(x)$, the max/min value, and the axis of symmetry.

$$\frac{1}{2(-1)} = -\frac{1}{2}$$

$$f\left(-\frac{1}{2}\right) = -\left(-\frac{1}{2}\right)^2 + \frac{1}{2} + 6.5$$

$$-\frac{1}{4} + \frac{1}{2} + 6.5$$

$$-.25 + .5 + 6.5$$

$$-.25 + 7 = 6.75$$

$$f(x) = -\left(x + \frac{1}{2}\right)^2 + 6.75$$

Vertex: $\left(-\frac{1}{2}, 6.75\right)$

Max @ $\left(-\frac{1}{2}, 6.75\right)$

Axis: $x = -\frac{1}{2}$