Pre Calc GIT

Notes:

- The use of a calculator is permitted.
- Unless otherwise specified, if a decimal approximation is used, it must be accurate to three places after the decimal point.

Reference Information:

Quadratic Formula: If $ax^2+bx+c=0$, then $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$.

Factoring: $a^3+b^3=(a+b)(a^2-ab+b^2)$ $\quad$ $a^3-b^3=(a-b)(a^2+ab+b^2)$

Laws of Exponents:

$(a^m)^n=a^{mn}$ $\quad$ $\dfrac{a^n}{a^m}=a^{n-m}$ $\quad$ $(ab)^n=a^nb^n$ $\quad$ $\left(\dfrac{a}{b}\right)^n=\dfrac{a^n}{b^n}$ $\quad$ $a^{-n}=\dfrac{1}{a^n}$

$a^{\frac{m}{n}}=\sqrt[n]{a^m}$ or $\left(\sqrt[n]{a}\right)^m$

Compound Interest:

Continuously: $A=Pe^{rt}$ $\quad$ n times per year: $A=P\left(1+\dfrac{r}{n}\right)^{nt}$

Arithmetic Sequence and Series:

$a_n=a_1+(n-1)d$ $\quad$ $S_n=n\left(\dfrac{a_1+a_n}{2}\right)=n\left(\dfrac{2a_1+(n-1)d}{2}\right)$

Geometric Sequence and Series:

$a_n=a_1r^{n-1}$ $\quad$ $S_n=a_1\left(\dfrac{1-r^n}{1-r}\right)$

Conic Sections – GT ONLY

Circle	$x^2+y^2=r^2$ Center $(0,0)$ radius r
Parabola	$x^2=4py$ or $y=\frac{1}{4p}x^2$ opens up if $p>0$, opens down if $p<0$ Vertex $(0,0)$ $y^2=4px$ or $x=\frac{1}{4p}y^2$ opens right if $p>0$, opens left if $p<0$ Vertex $(0,0)$ p is the distance from the vertex to the focus and from the vertex to the directrix
Ellipse	$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ major axis horizontal Center $(0,0)$ $a>b$ $\frac{x^2}{b^2}+\frac{y^2}{a^2}=1$ major axis vertical Center $(0,0)$ $a>b$ $a=$center to vertex, $c=$center to focus $c^2=a^2-b^2$
Hyperbola	$\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ transverse axis horizontal Center $(0,0)$ $\frac{y^2}{a^2}-\frac{x^2}{b^2}=1$ transverse axis vertical Center $(0,0)$ $a=$center to vertex $c=$center to focus $c^2=a^2+b^2$

From Algebra 2 GT

Circle	$(x-h)^2+(y-k)^2=r^2$ Center (h,k) radius r
Parabola	$(x-h)^2=4p(y-k)$ or $y-k=\frac{1}{4p}(x-h)^2$ opens up if $p>0$, opens down if $p<0$ Vertex (h,k) $(y-k)^2=4p(x-h)$ or $x-h=\frac{1}{4p}(y-k)^2$ opens right if $p>0$, opens left if $p<0$ Vertex (h,k) p is the distance from the vertex to the focus or vertex to the directrix
Ellipse	$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$ major axis horizontal Center (h,k) $a>b$ $\frac{(x-h)^2}{b^2}+\frac{(y-k)^2}{a^2}=1$ major axis vertical Center (h,k) $a>b$ $a=$center to vertex, $c=$center to focus $c^2=a^2-b^2$
Hyperbola	$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$ transverse axis horizontal Center (h,k) $\frac{(y-k)^2}{a^2}-\frac{(x-h)^2}{b^2}=1$ transverse axis vertical Center (h,k) $a=$center to vertex $c=$center to focus $c^2=a^2+b^2$

Name _____

USE A SEPARATE SHEET OF PAPER AND SHOW ALL WORK.
PROBLEMS WITH AN ASTERISK * ARE FOR GT ONLY.

I. Polynomials and operations on real and imaginary numbers.

A. Simplify these expressions

1. $\sqrt{-100}$
2. $\sqrt{-4 \cdot -9}$
3. $(i\sqrt{7})^2$
4. $\sqrt[3]{2x} \cdot \sqrt[3]{4x^2y^2} \cdot \sqrt[3]{2y^4}$
5. $(3 + 2i) + (5 + 7i)$
6. $2i\,(3 - i)$
7. $(3 + 2i)\,(3 - 2i)$
8. $(3+i\sqrt{5})^2$
9. $\dfrac{8}{-2i}$
10. $-\sqrt{-9}$

*11. $\dfrac{5i}{6-2i}$ (Hint: Use the conjugate of denominator)

B. Factor Completely

1. $t^2 - 4t - 21$
2. $8x^3 - 1$ hint: use formula
3. $x^3 + 125$ hint: use formula
*4. $x^3 - 2x^2 - 4x + 8$ Hint: grouping

C. Simplify the following expressions.

1. $5x^2 \bullet 2x^5$
2. $(-2c^3)^2$
3. $t^3 \bullet t^{(n-3)}$
4. $\dfrac{10 \cdot 2^6}{8 \cdot 2^{-2}}$

*5. $(x^m)^n \bullet (x^n)^{n-m}$

D. Divide and simplify these expressions. Use either polynomial long division or synthetic division.

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

E. Solve each quadratic equation for x using either factoring techniques, or the quadratic formula.

1. $(x - 1)(x + 3) = 0$
2. $x(x-4)=2(4 -x)$
3. $x^2 + 4x = -3$
4. $2x^2 - 32x = 0$

F. Graph the functions using a calculator. Sketch it on your paper. Describe the following characteristics for each function:

a. domain and range b. zeros c. y-intercept d. end behavior
e. intervals where the function is increasing and/or decreasing

1. $f(x) = x^3 - 3x^2 + x + 1$
2. $f(x) = x^2+2x+1$

II. Function Operations

A. If $f(x) = x^2 - 4$ and $g(x) = \sqrt{2x+4}$, determine

1. f(3)
2. f(x) = 0 when x = ?
3. f(g(4))
4. f(g(x))
5. Domain of f(g(x))
6. g(f(0))
7. * g(f(a + 2))
8. $f^{-1}(x)$

III. Rational Expressions and Rational Functions

A. Graph the following functions using a table of 5 values. Also identify:
a. domain b. range c. asymptotes

1. $f(x)=\frac{2x}{x+4}$
2. $h(x)=\frac{3}{x+1}-2$
3. $k(x)=\frac{4}{x-2}$

B. Simplify. Write your answer as a single fraction.

1. $\frac{3x^2+6x^3}{9x}$

2. $\frac{x^2-25}{x^2+7x+10}$

3. $\frac{2x}{x+5} \div \frac{6x^2}{2x+10}$

4. $\frac{\frac{3}{x+2}}{\frac{6}{x}}$

5. $\frac{x-2}{x}+\frac{x+4}{2x}$

6. $\frac{4x}{x+6}+2$

IV. Rewriting and Solving Equations

A. Solve each equation for y.

1. $7y + 6x = 10$

2. $\frac{1}{4}y-7x=\frac{15}{2}$

B. Find the solution(s) of the given systems of equations. Write answers in the form (x, y).

1. $-2x - 5y = 7$
   $7x + y = -8$

2. $4x + 9y = 2$
   $2x + 6y = 1$

C. Solve for x and y.

1. $x+9y=9$
   $3x+6y=6$

V. Pythagorean Theorem.

A. Solve for the missing side of the triangle using the Pythagorean Theorem $a^2 + b^2 = c^2$:

1. a = 6 ft. b = 8 ft.

2. b = 17 ft. c = 19 ft.