

## Algebra & Polynomials (A, 1, 2)

**Selected Examples:**

1. Factor:  $x^3 + 64$

2. Find the Horizontal Asymptotes:  $y = \frac{7x^2 + 3x}{8x^2 - 20}$

**Practice:**

<b>Factoring (A)</b>	1. Factor: $8x^3 - 27$	2. Factor: $4x^3 - 8x^2 - 25x + 50$	
<b>Solving equations (A)</b>	3. Solve: $5x^2 - 2 = 3x$	4. Solve: $2x^2 + 12x + 13 = 0$	
<b>Domain (1)</b>	5. State the domain: $y = \sqrt{x+6}$	6. State the domain: $y = \frac{x+3}{(x-1)}$	7. State the Domain: $y = x^2 + 2$
<b>Composition (1)</b>	(for #8 and #9) $f(x) = 3x^2 - 7x$ $g(x) = 4x + 2$	8. Find $(g \circ f)(x)$	9. Find $(f \circ g)(4)$
<b>Inverse (1)</b>	10. Find the inverse: $f(x) = \sqrt[3]{x^2 + 7}$		
<b>Shifts &amp; Stretches (1)</b>	11. Write the equation of $g(x)$ , which is $f(x) = \sqrt{x}$ shifted 3 units down and 5 units right.		
<b>Asymptotes (2)</b>	12. State the vertical and horizontal asymptotes of: a. $f(x) = \frac{3x+5}{2x^2-16}$ b. $f(x) = \frac{3x^4+5}{2x^2-16}$ c. $f(x) = \frac{3x^2+5}{2x^2-16}$		
<b>Polynomial Division (2)</b>	13. Divide synthetically: $(5x^4 - 2x^2 + 1) \div (x+1)$	14. Divide Synthetically: $(3x^4 + 2x^3 - 3x + 1) \div (x-5)$	
<b>Descarte's Rule &amp; RZT (2)</b>	15. $f(x) = 3x^4 + 6x^2 - 25x - 21$ a. State the number of possible <i>negative and positive real zeros</i> of $f(x)$ .  b. List all possible <i>rational zeros</i> .		





<b>Arithmetic Sequences (9)</b>	11. $a_{12} = 26$ and $d = 13$ for an arithmetic sequence. Find a formula $a_n$	12. $a_{10} = 50$ and $a_{15} = 75$ for an arithmetic sequence. Find a formula $a_n$
<b>Arithmetic Series (9)</b>	13. Evaluate: $\sum_{i=1}^{60} 4i + 75$	14. Evaluate: $\sum_{i=3}^{500} 3i - 1$
<b>Geometric Sequences (9)</b>	15. $a_n = 3(2)^{n-1}$ , find the first 4 terms of the sequence (assume n starts at 1).	
<b>Geometric Series (9)</b>	16. Evaluate: $\sum_{i=1}^5 3(4)^i$	17. Evaluate: $\sum_{i=1}^{\infty} 2\left(\frac{1}{5}\right)^i$

<b>Mixed Review</b>	18. Determine the horizontal asymptote: $y = \frac{8x^5 - 3x^2}{5x^8 + 3x}$
	19. State the domain: $y = \sqrt{4 - x}$ .

## Trigonometry(4), Law Sines/Cosines(6) & Polar Coordinates(10)

**Selected Examples:**

1. Solve for x on  $(0, 2\pi]$ :  $6\sin^2 x = 3$

2. Convert to Rectangular form:  $\left(6, \frac{-2\pi}{3}\right)$

**Practice:**

<b>Basic Trig (4)</b>	1. Evaluate (in simplest radical form): $\cos\left(\frac{5\pi}{6}\right)$	2. Evaluate (in simplest radical form): $\sin(-135^\circ)$
<b>Basic Trig (4)</b>	3. Find 2 values of $\theta$ , such that $0 < \theta \leq 360^\circ$ : $\tan \theta = -2.7475$	
<b>Trig Graphs (4)</b>	4. State the amplitude, period and shifts of: $y = 3 - 4\cos(2x + \pi)$	
<b>Solving equations (5)</b>	5. Solve on $(0, 2\pi]$ : $2\cos x - \sqrt{3} = 0$	6. Solve on $(0, 360^\circ]$ : $2\sin^2 x - 5\sin x = -3$
<b>Trig Formulas (5)</b>	7. $\cos u = -\frac{4}{7}$ , $\tan u > 0$ find: $\cos 2u$ and $\sin 2u$  (in simplest radical form)	8. $A = 330^\circ$ and $B = 45^\circ$ , evaluate: $\sin(A + B)$ and $\cos(A - B)$  (in simplest radical form)

<b>Law of Sines &amp; Cosines (6)</b>	9. Given a triangle with $a=18$ , $b=23$ , and $B=97^\circ$ , find C.
<b>Law of Sines &amp; Cosines (6)</b>	10. Given a triangle with sides $a = 19$ , $b=4$ , and $c=22$ , find C.
<b>Area of a triangle (6)</b>	11. Find the area of a triangle with side lengths $\{16, 37, 32\}$ .
<b>Area of a triangle (6)</b>	12. Find the area of a triangle such that $c=21.49$ , $a=91.6$ , and $B=37^\circ$ .

<b>Converting to Polar (10)</b>	13. Convert $(-2, -\sqrt{3})$ into polar form.	14. Convert $(-\sqrt{6}, \sqrt{2})$ into polar form.
<b>Converting to Rectangular (10)</b>	15. Convert $(3, -\pi)$ into rectangular form	16. Convert to rectangular form: $\left(-4, \frac{2\pi}{3}\right)$

<b>Mixed Review</b>	17. List the possible rational zeros of: $f(x) = 6x^3 - 3x^2 + x - 7$
	18. For the arithmetic sequence, $a_4 = 15$ and $a_9 = 65$ . Find a formula for $a_n$ .

## Vectors (6) & Complex Numbers (6)

### Selected Examples:

1. Vector  $\mathbf{v}$  has initial point  $(-4, 8)$  and final point  $(3, 2)$ . Express  $\mathbf{v}$  in linear combination form.

2. Find a vector in the direction of  $\mathbf{v}$  with a magnitude of 5.

3. Use DeMoivre's Theorem to evaluate:  $(3 - 3i)^4$ .

### Practice:

<b>Vectors - Component Form (6)</b>	1. Vector $\mathbf{w}$ has initial point $(3, 7)$ and final point $(3, -2)$ . Write vector $\mathbf{w}$ in <i>component</i> form.
<b>Vectors - Linear Combination Form (6)</b>	2. Vector $\mathbf{w}$ has initial point $(2, -1)$ and final point $(4, 1)$ . Write vector $\mathbf{w}$ as a <i>linear combination</i> of the unit vectors $\mathbf{i}$ and $\mathbf{j}$ .
<b>Vectors - Trigonometric Form (6)</b>	3. Vector $\mathbf{v} = \langle -3, 3 \rangle$ . Write $\mathbf{v}$ in <i>trigonometric</i> form.
<b>Unit Vectors (6)</b>	4. Vector $\mathbf{v} = 4\mathbf{i} - 10\mathbf{j}$ . Find a vector in the direction of $\mathbf{v}$ with a magnitude of 8.

<b>Complex Numbers – Trigonometric Form (6)</b>	5. Write the complex number $z = 2(\cos(270^\circ) + i\sin(270^\circ))$ in standard form.
<b>Complex Numbers – Trigonometric Form (6)</b>	6. Write the complex number $z = -5 + 4i$ in <i>trigonometric</i> form.
<b>DeMoivre's Theorem – Powers (6)</b>	7. Use DeMoivre's Theorem to evaluate $(3 + 3i)^8$ in standard form.
<b>DeMoivre's Theorem – Roots (6)</b>	8. Find the cube roots of $-27i$ .

**Mixed Review**

9. Factor:  $6x^3 - x^2 + 18x - 3$

10. Solve for  $x$  on  $[0, 2\pi)$ :  $\cos^3 x - \cos x = 0$

11. Synthetically divide:  $(8x^4 - 4x^2 + 3x - 1) \div (x - 6)$

12. Simplify into a single logarithm:  $8 \ln(x) - 2(\ln(x) + 3 \ln(y))$

13. Evaluate:

a.  $\sum_{i=1}^{\infty} (3/4)^i$

b.  $\sum_{i=5}^{40} 8i - 5$