

## H-B WOODLAWN PROGRAM

ARLINGTON PUBLIC SCHOOLS

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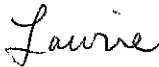
May 31, 2018

Dear AB Calculus student,

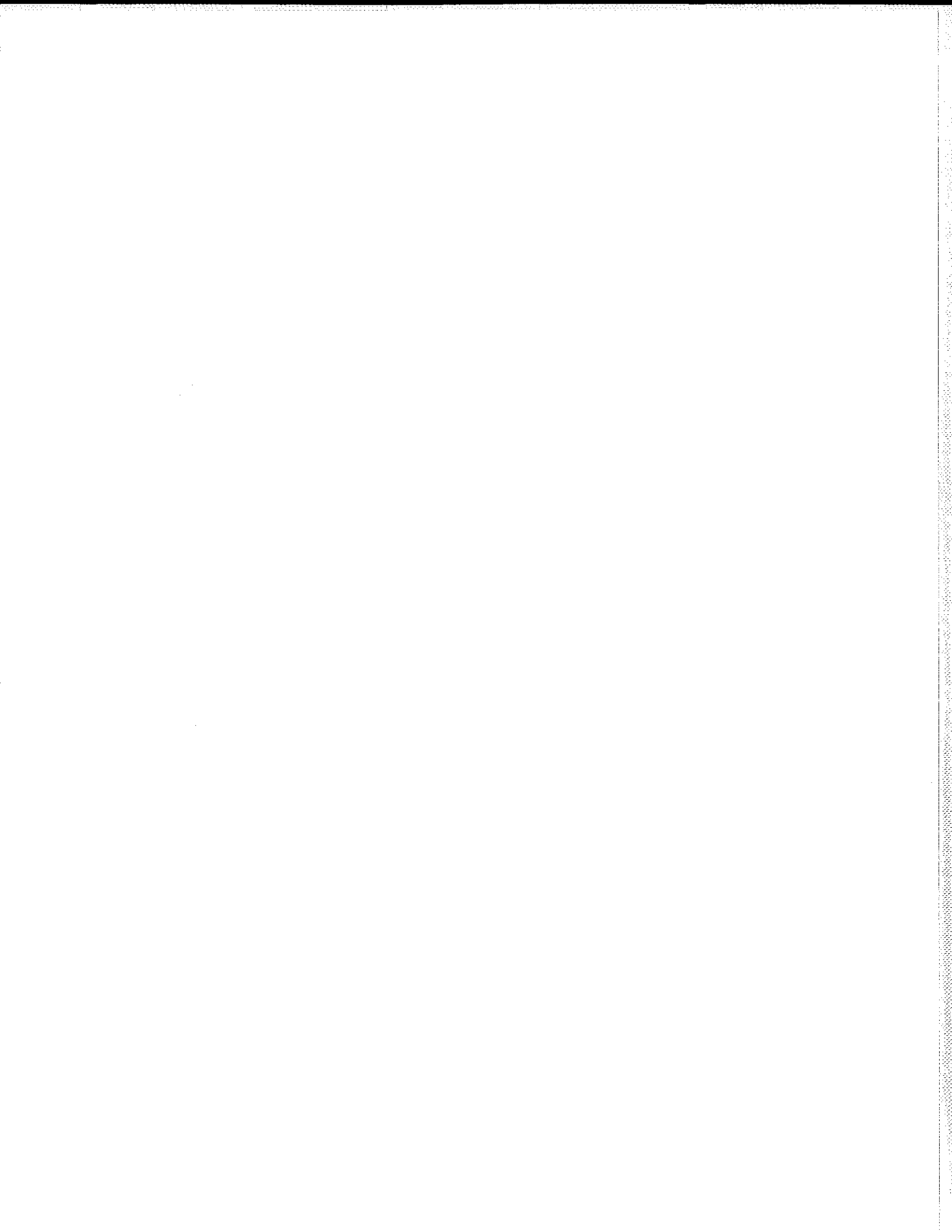
Welcome to AB Calculus! I am looking forward to a great year of Calculus with you. This is a college level course for college credit. You can earn one semester, of college calculus credit, if you perform well on the AP AB Calculus exam next May. Calculus is fun, challenging and creative. I want you to enjoy it as much as I do. You should plan to set aside time each day to study and do the homework.

Here are some details of our class:

- Have your own TI 83, 84 or TI 89 calculator- if TI 89 you may obtain a self paced guide from me – if needed
- Complete the attached summer packet for a bonus grade when you return in the fall. The answers are included for you to check your work. You must show your work thoroughly for credit. If needed, I will be available for help with it, the week before school- send me an email at [laurie.lewis@apsva.us](mailto:laurie.lewis@apsva.us) to schedule a help session.



Laurie Lewis



These problems are representative of the kinds of algebra and pre-calculus topics that you must be **proficient** at in order to be successful in calculus. There is a pre-calculus (trigonometry) summary on the last two pages. Email Laurie at [laurie.lewis@apsva.us](mailto:laurie.lewis@apsva.us) if you need help, the week before school begins, to set up a time for help. This will be turned in for a grade when you return to school.

I. Simplify:

Simplify each of the following. That includes distributing and adding like terms, rationalizing the denominator, simplifying fractions by factoring and canceling common factors, simplifying complex fractions (combine to single numerator and single denominator before multiplying by reciprocal!), simplifying radicals, and simplifying using the properties of exponents.

<p>1) <math>x(2x+3(x-(2x+1)))</math></p>	<p>2) Rationalize denominator:  <math display="block">\frac{\sqrt{x}}{\sqrt{x+3}}</math></p>
<p>3) <math>\frac{x+\frac{1}{y}}{y+\frac{1}{x}}</math></p>	<p>4) <math>\frac{(9x^2+3x-2)}{(9x^2-1)} \cdot \frac{(3x^2+13x+4)}{(27x^3+8)}</math></p>
<p>5a) <math>\sqrt[3]{\sqrt{x}}</math>                       b) <math>\sqrt[3]{x} \cdot \sqrt{x}</math></p>	<p>6a) <math>(3x^2y)^3</math>                       b) <math>\frac{2x^6y^5}{8x^{-1}y}</math></p>
<p>7) <math>\sqrt{18x^3} + x\sqrt{2x}</math></p>	<p>8) <math>2e^{3x} \cdot 4e^x</math></p>

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II. Evaluate:

Evaluate each of the following.

<p>9) <math>2\log_2 4 + \frac{1}{2}\log_2 5 - \frac{1}{2}\log_2 20</math></p>	<p>10a) <math>\sin\left(\frac{7\pi}{6}\right)</math>  b) <math>\cos\left(\frac{3\pi}{4}\right)</math></p>
<p>11a) <math>\tan\left(-\frac{5\pi}{3}\right)</math>  b) <math>\cot\left(\frac{5\pi}{4}\right)</math>  c) <math>\sec\left(\frac{5\pi}{3}\right)</math></p>	<p>12a) <math>\cos^{-1}(-1)</math> <i>answer in <math>[0, 2\pi)</math></i>  b) <math>\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)</math>  c) <math>\tan^{-1}(-1)</math></p>
<p>13) If <math>f(x) = \frac{x}{1-x}</math>, find <math>f\left(\frac{1}{x}\right)</math></p>	<p>14) If <math>f(x) = \frac{x}{1-x}</math>, find <math>f(1-x)</math></p>
<p>15) If <math>f(t) = \sqrt{4+t^2}</math>, find <math>f(3x)</math></p>	<p>16) If <math>f(x) = e^{x^2}</math>, find <math>f(x+h)</math></p>

III. Solve Equations:

Solve each of the following. Check all solutions! (Remember extraneous solutions?)  
Try factoring polynomials first. Use quadratic formula or graph zeros if necessary.

<p>17) <math>5 - 3 2x + 1  = 8</math></p>	<p>18) <math>\frac{1}{3} x - 5  = 2</math></p>	<p>19) <math>6x^2 + 18x = 0</math></p>
<p>20) <math>x^2 - 6x + 9 = 0</math></p>	<p>21) <math>15x^2 + 7x - 2 = 0</math></p>	<p>22) <math>21x^2 - 77x = 28</math></p>

Solve Equations - continued:

23) $7(x-4)^2 - 18 = 10$	24) $x^2 + 8x = -1$	25) $4x^2 + 3 = x^2 - 7x$
26) $x^2 + 6x = -15$	27) $18s^3 = 50s$	28) $27x^3 + 8 = 0$
29) $3s^4 - s^2 - 24 = 0$	30) $4c^3 + 8c^2 - 9c - 18 = 0$	31) $x^4 - 13x^2 + 37 = 7$
32) $f(x) = x^4 - 2x^3 - 3x^2 + 2x + 2$ Graph zeros, use synthetic division to depress polynomial and solve last 2 zeros.		33) $g(x) = 4x^4 + 4x^3 - 11x^2 - 12x - 3$
34) $3\sqrt[3]{16x} - 7 = 17$	35) $x - 10 = \sqrt{9x}$	36) $2x^{3/2} = 16$
37) $1 - \frac{3}{x} = \frac{4}{5}$	38) $\frac{9}{x^2 - 6x + 9} = \frac{3x}{x^2 - 3x}$	39) $\frac{x+1}{3x-1} + \frac{2x+1}{3x-2} = -1$

Solve Equations - continued: for trig equations, give answers in exact radians in  $[0, 2\pi)$

40) $8^{x-1} = 32^{3x-2}$	41) $3^x \cdot 3^{x+1} = 9$	42) $\frac{3}{4}e^{2x} + \frac{7}{2} = 4$
43) $\log_3(x-1) = 2$	44) $\log_2 x + \log_2(x-2) = 3$	45) $\tan x = 2\sin x$
46) $2\sin^2 x - \cos x = 1$	47) $\cos(2\theta) = \frac{1}{2}$	48) $\sin^2 x = \sin x$

IV. Solve Inequalities:

Rewrite as one of two types of compound inequalities. Solve and graph on number line.

49) $3 x+2 +5 \leq 14$	50) $-\frac{1}{2} x+4  < -3$
Graph:	Graph:
51) $x^2 - 3x > 54$	52) $4x^2 - 25 \leq 0$
Graph:	Graph:

V. Solve Systems:

Solve each system of equations. Check by graphing with calculator.

<p>53)</p> $y = 2 x - 1  + 3$ $y = \frac{1}{2}x + 5$	<p>54)</p> $x^2 + y^2 = 25$ $x - y = 1$
<p>55)</p> $y = 2\sqrt{x}$ $y = 6$	<p>56) Use calculator &amp; round solution to 3 decimal places.</p> $y = \sqrt{x}$ $y = e^{-3x}$

VI. Modeling:

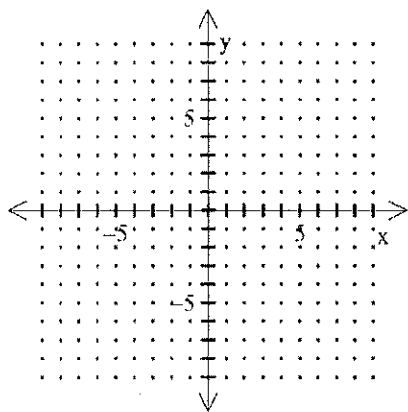
Write an equation for the function that models the given information.

<p>57) Write the point-slope form equation for a line that has a slope of 3 and passes through the point <math>(-2, 5)</math></p>	<p>58) Write a quadratic equation for a vertical parabola that has a vertex at <math>(2, -4)</math> and passes through the point <math>(4, 8)</math></p>
<p>59) Write the equation of a sinusoid that has an amplitude of 5, a period of <math>\pi</math>, and passes through the point <math>\left(\frac{\pi}{4}, 0\right)</math></p>	<p>60) Write a model for a quantity that grows exponentially. It has an initial quantity of 10 and passes through the point <math>(3, 1250)</math>.</p>

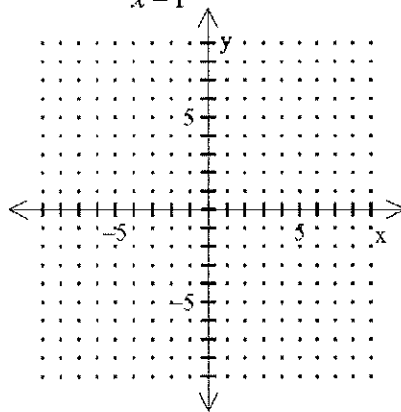
VII. Functions:

Sketch a graph of #61 and 63 by graphing the parent function (with dashed line) and then using transformations to draw the given function. Identify the domain and range, asymptotes (label on the graph), the intervals where the function is increasing and the end behavior (both ends!) of each function.

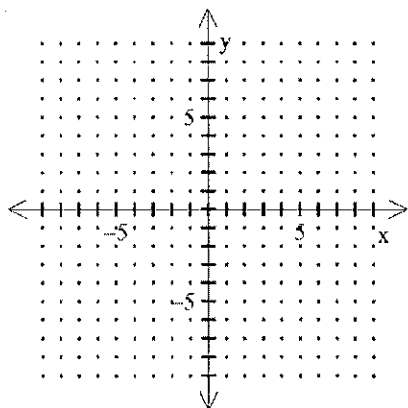
61)  $f(x) = \log_2(x-1) + 3$



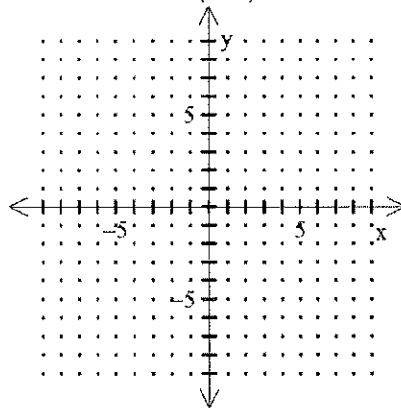
62)  $f(x) = \frac{3x}{x-1}$



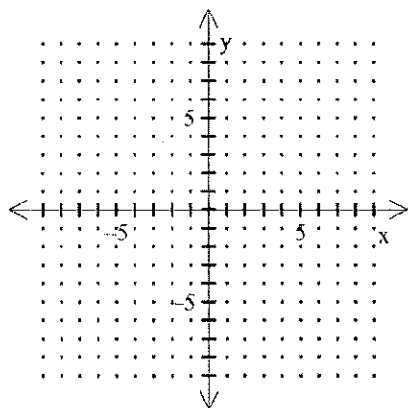
63)  $f(x) = 3e^{5-x}$



64)  $f(x) = 2 \cos\left(\frac{1}{2}x\right) + 1$



65)  $f(x) = -\tan\left(x - \frac{\pi}{4}\right)$

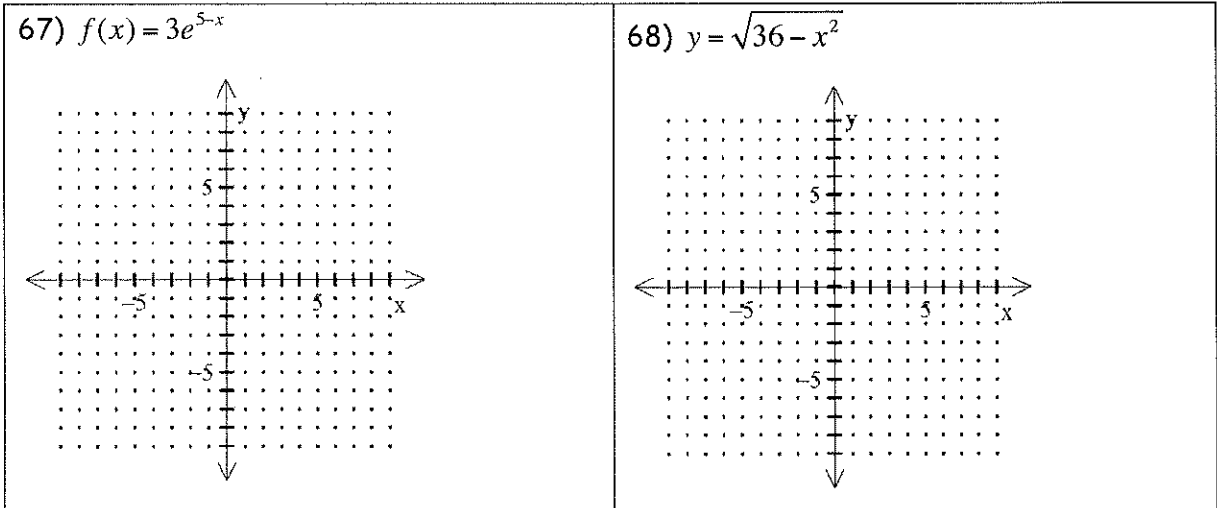


66) Make your own axes with scale!

$$f(x) = \begin{cases} \sqrt{4-x}, & x \leq 0 \\ 2-3x, & 0 < x \leq 2 \\ x^2, & x > 2 \end{cases}$$

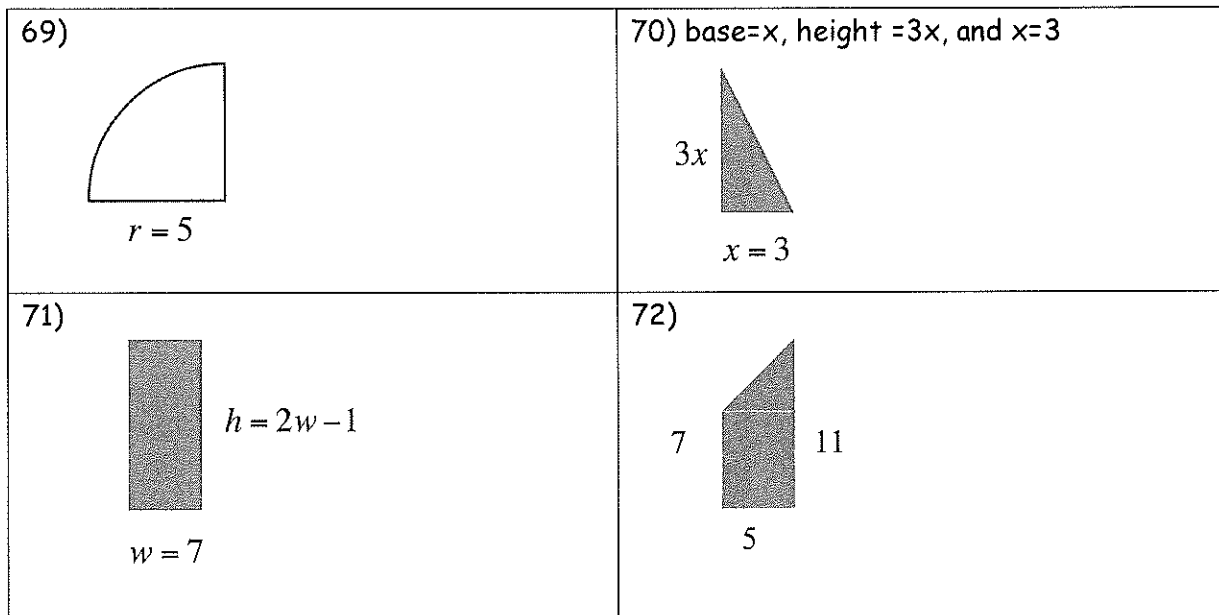


Functions - continued:



VIII. Area:

Find the area of each figure. These require the area formulas that you are expected to know. (There is NO formula sheet for the AP exam!)

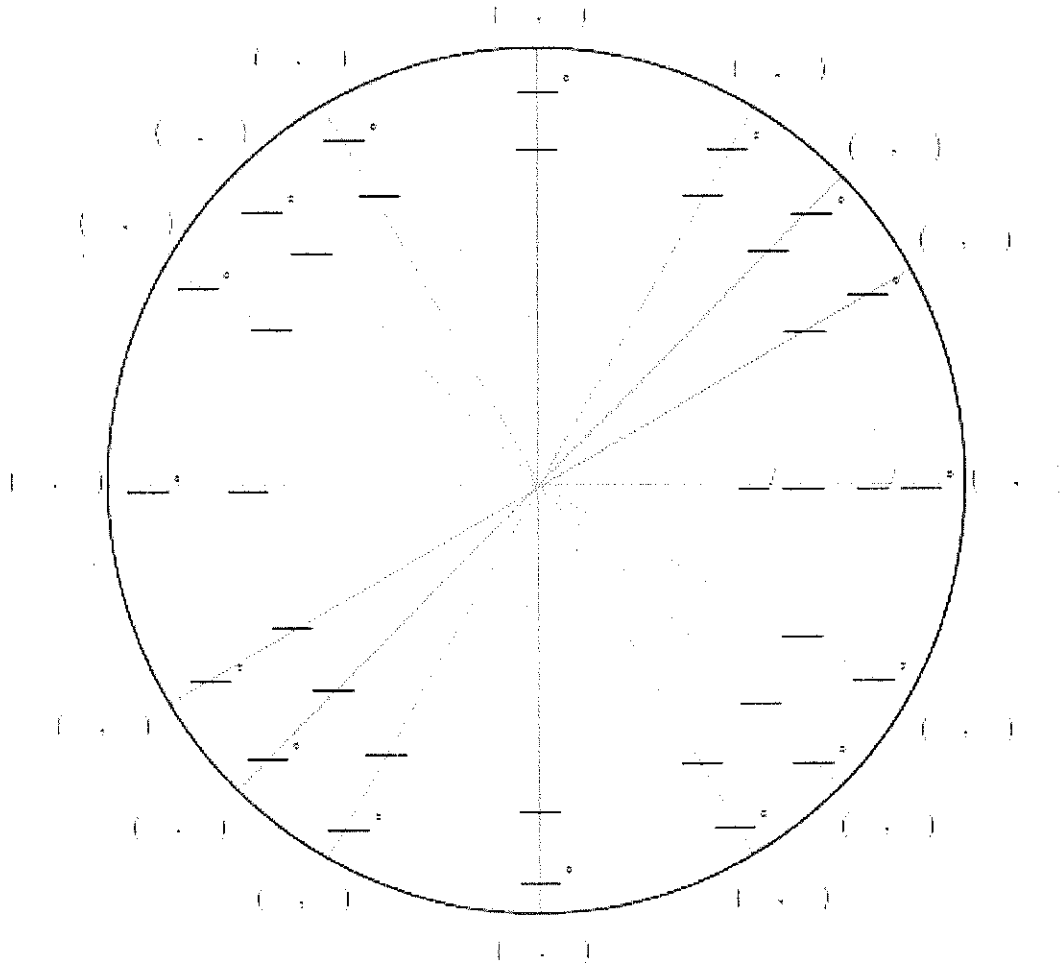


IX. Slope:

73) Find the slope between the points $(-4, 9)$ and $(2, 4)$ .					
74) Estimate the slope at $x = 3$ given the table of values.					
$x$	0	2	5	6	10
$f(x)$	4	7	12	12	15

X. Know thy unit circle!

Complete the following unit circle. Show both degrees and radians for angle measures and fill in the ordered pairs as trigonometric ratios. You can check your circle with any number of online resources!



Answer Key to Summer Packet - SHOW YOUR WORK FOR CREDIT

1.  $-x^2 - 3x$
2.  $\frac{x - 3\sqrt{x}}{x - 9}$
3.  $\frac{x}{y}$
4.  $\frac{x + 4}{9x^2 - 6x + 4}$
5. a.  $\sqrt[6]{x}$   
b.  $\sqrt[6]{x^5}$
6. a.  $27x^6y^3$   
b.  $\frac{x^7y^4}{4}$
7.  $4x\sqrt{2x}$
8.  $8e^{4x}$
9. 3
10. a.  $-\frac{1}{2}$   
b.  $-\frac{\sqrt{2}}{2}$
11. a.  $\sqrt{3}$   
b. 1  
c. -2
12. a.  $\pi$   
b.  $\frac{\pi}{3}, \frac{2\pi}{3}$   
c.  $\frac{3\pi}{4}, \frac{7\pi}{4}$
13.  $f(x) = \frac{1}{x-1}$
14.  $f(1-x) = \frac{1-x}{x}$
15.  $f(3x) = \sqrt{4+9x^2}$
16.  $f(x+h) = e^{x^2+2xh+h^2}$
17. No solution
18. -1, 11
19. -3, 0
20. 3
21.  $-\frac{2}{3}, \frac{1}{5}$
22.  $-\frac{1}{3}, 4$
23. 2, 6
24.  $-4 \pm \sqrt{5}$
25.  $\frac{-7 \pm \sqrt{13}}{6}$
26. No solution
27.  $-\frac{5}{3}, 0, \frac{5}{3}$
28.  $-\frac{2}{3}$
29. -3, 3
30.  $-\frac{3}{2}, -2, \frac{3}{2}$
31.  $\pm\sqrt{3}, \pm\sqrt{10}$
32.  $1 \pm \sqrt{3}$
33.  $\pm\sqrt{3}, \frac{1}{2}$
34. 32
35. 25
36. 4
37. 15
38. 6
39.  $-\frac{1}{9}, \frac{1}{2}$
40.  $\frac{7}{12}$
41.  $\frac{1}{2}$
42.  $\frac{\ln(\frac{2}{3})}{2}$
43. 10
44. 4
45.  $0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}$
46.  $\frac{\pi}{3}, \pi, \frac{5\pi}{3}$
47.  $\frac{\pi}{6}, \frac{7\pi}{6}, \frac{5\pi}{6}, \frac{11\pi}{6}$
48.  $0, \pi, \frac{\pi}{2}$
49.  $-5 \leq x \leq 1$
50.  $x > 2$  or  $x < -10$
51.  $x < -6$  or  $x > 9$

52.  $-\frac{5}{2} \leq x \leq \frac{5}{2}$

53.  $(\frac{8}{3}, \frac{19}{3}), (0, 5)$

54.  $(-3, -4), (4, 3)$

55.  $(9, 6)$

56.  $(.239, .489)$

57.  $y - 5 = 3(x + 2)$

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

59.  $y = 5 \sin(2\theta - \frac{\pi}{2})$

60.  $y = 10 \cdot 5^x$

69.  $\frac{25\pi}{4}$

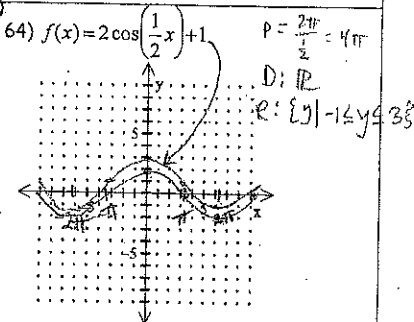
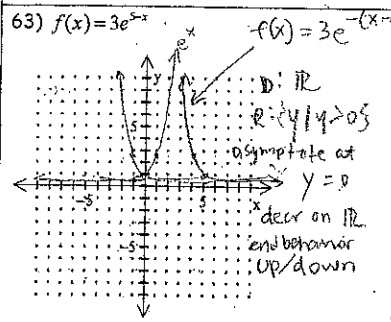
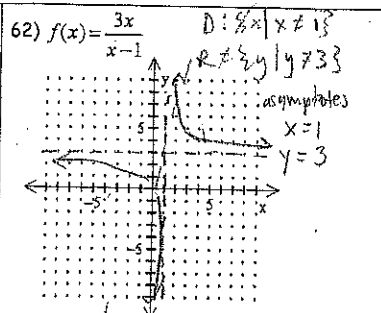
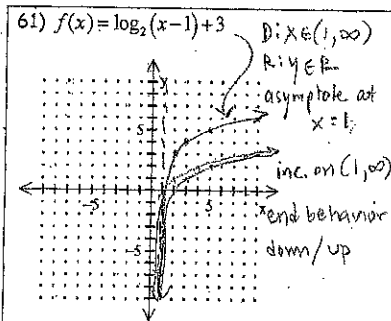
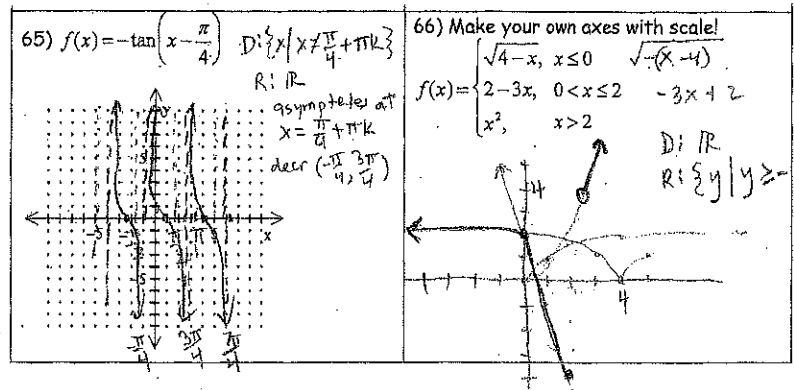
70.  $\frac{27}{2}$

71. 91

72. 45

73.  $-\frac{5}{6}$

74.  $\frac{5}{3}$



Functions - continued:

