

ALGEBRA FOR CALCULUS
PLUS FINAL REVIEW SHEET
ANSWERS Fall 2014

1. a) F; $\{-2, 0, 1, 2, 7\}$;
 $\{-7, -4, -2, 2, 7\}$
b) F; $(-\infty, \infty)$; $[0, \infty)$
c) F; $(-\infty, \infty)$; $(-\infty, \infty)$
d) NF; $[0, \infty)$; $(-\infty, \infty)$
e) F; $(-\infty, \infty)$; $(-\infty, \infty)$

2. a) $f(1) = -2$
b) $f(-1) = 2$
c) $f(0) = 0$
d) 3 values: $x \cong -1.2$
 $x \cong -0.6$
 $x \cong 1.5$

3. a) $f(-4) = 24$
b) $f(0) = 0$
c) $f(-x) = 2x^2 - 2x$
d) $2x^2 - 10x + 12$
e) $2x^2 + 4xh + 2h^2 + 2x + 2h$
f) $4x + 2h + 2$

4. a) $(-\infty, \infty)$, $x \neq 3$
b) $\left[-\frac{15}{2}, \infty\right)$
c) $(-4, \infty)$
d) $x \neq 1$, $x \neq 5$
e) $\left(-\frac{4}{3}, \infty\right)$

5. a) D: $[3, \infty)$; R: $[2, \infty)$
b) D: $(-\infty, \infty)$; R: $(0, \infty)$
c) D: $[-3, 3]$; R: $[0, 3]$

6. \$ 161.4 million per year

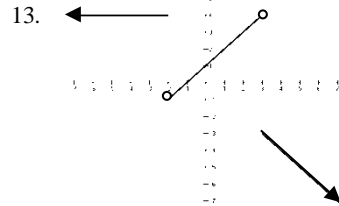
7. $x - 3y = -10$ or $y = \frac{1}{3}x + \frac{10}{3}$

8a) $x + 2y = 7$ or $y = -\frac{1}{2}x + \frac{7}{2}$

8b) $2x - y = -6$ or $y = 2x + 6$

9. $x = -5$
10. $y = 22$

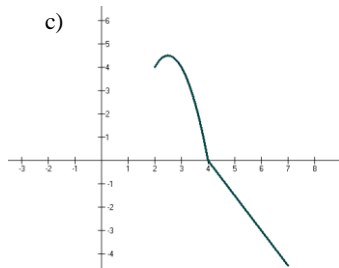
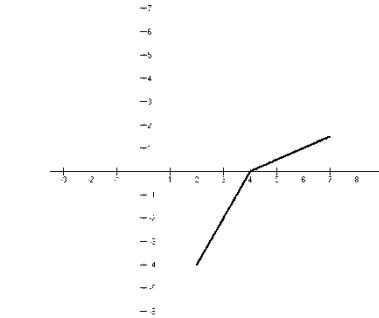
11. $P(n) = 100000 - 350n$
12. a) -5
b) 4
c) 3.5



14. a) Increasing: $(-10, -8)$, $(-2, 1)$
b) Decreasing: $(-8, -7)$, $(1, 9)$
c) Constant: $(-7, -2)$

15. a) $A(x) = -\frac{3}{2}x^2 + 180x$
b) Domain: $(0, 120)$

16. a) $[2, 10]$ $[0, 7]$ $[2, 7]$
b)



17. a) $[0, 2]$
b) $\sqrt{x} + \sqrt{2-x}$

18. a) $x \neq 1$, $x \neq 6$ OR
 $(-\infty, -1) \cup (-1, 6) \cup (6, \infty)$

b) $\frac{25-3x}{(x+1)(6-x)}$

19. a) $f \circ g = 1 + 2\sqrt{x}$;
 $g \circ f = \sqrt{1+2x}$

b) domain of $f \circ g = [0, \infty)$
domain of $g \circ f = \left[-\frac{1}{2}, \infty\right)$

20. $f \circ g = 2x^2 - 6x + 11$;
 $g \circ f = 4x^2 - 2x + 3$

21. origin

22. a) Neither

b) Neither

c) Even

23. a) $y = \sqrt{x-2} - 3$

b) $y = -2x^2 + 5$

c) $y = \frac{1}{3x} + 2$

24. a) $\sqrt{13}i$ b) $-7i$

25. a) $18 + 13i$

b) $-4 - 5i$

c) $\frac{1}{2} - \frac{1}{2}i$

d) -1

26. a) $\frac{-1 \pm \sqrt{22}}{3}$

b) $-\frac{5}{2} \pm \frac{\sqrt{7}}{2}i$

27. $f(x) = 2\left(x - \frac{3}{2}\right)^2 - \frac{7}{2}$

a) vertex: $\left(\frac{3}{2}, -\frac{7}{2}\right)$

b) axis of symmetry: $x = \frac{3}{2}$

c) Since the leading coefficient is positive, the function has a minimum. The minimum value is $-\frac{7}{2}$

28. a) $t = 1.875$ seconds

b) Max height is 86.25 ft.

29. odd

30.

Zeros	Mult	at x-axis
0	3	cross
-3	2	tangent
4	1	cross
-1	4	tangent

31.

Zeros	Mult	at x-axis
1	1	cross
-2	2	tangent
2	1	cross

End behavior:

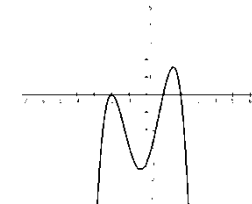
(degree is even and leading coefficient

is negative, so think about $y = x^2$ reflected about x-axis)

As $x \rightarrow \infty$, $y \rightarrow -\infty$

As $x \rightarrow -\infty$, $y \rightarrow -\infty$

Intervals	Test value	+ or -
$(-\infty, -2)$	$h(-3) = -10$	-
$(-2, 1)$	$h(0) = -4$	-
$(1, 2)$	$h\left(\frac{3}{2}\right) = \frac{49}{32}$	+
$(2, \infty)$	$h(3) = -25$	-



32. Quotient: $Q(x) = x^3 - 2x + 4$
Remainder: $R(x) = 0$

33. $P(-3) = 54$
Not a factor

34. a) ± 1 , $\pm \frac{1}{2}$, $\pm \frac{1}{4}$, $\pm \frac{1}{5}$,

$\pm \frac{1}{10}$, $\pm \frac{1}{20}$, ± 2 , $\pm \frac{2}{5}$

b) ± 1 , ± 2 , ± 3 , ± 4 ,

± 6 , ± 12 , $\frac{1}{2}$, $\pm \frac{3}{2}$

35. a) $\frac{1}{2}$, $\frac{1}{3}$

b) $\frac{2}{3}$, i , $-i$

c) 2 , $1 \pm 2i$,

d) 1 , $\frac{5}{2} \pm \frac{\sqrt{3}}{2}i$

e) $q(x) = (x-5)(2x-1)(x+3)$

36. a) $f(x) = x(x+3)\left(x - \frac{1}{2}\right)$

$= x^3 + \frac{5}{2}x^2 - \frac{3}{2}x$

b) $g(x) = (x+8)(x-3i)(x+3i)$
 $= x^3 + 8x^2 + 9x + 72$

c) $h(x) = (x+5)\left(x - \sqrt{3}\right)\left(x + \sqrt{3}\right)$
 $= x^3 + 5x^2 - 3x - 15$

37.

	Vert. asympt.	Hor. asympt.
a)	$x=8$	$y=0$
b)	$x=-5$	$y=1$
c)	$x=-1, x=-4$	$y=0$
d)	$x=5, x=-5$	None

38. a) No zeros

- b) 2
- c) -3
- d) 0, 1, -3

39. a) $(-\infty, -2] \cup [4, \infty)$

- b) $(-\infty, -2] \cup [-1, 2]$
- c) $[-\sqrt{3}, \sqrt{3}] \cup [2, \infty)$
- d) $(-\infty, 5)$
- e) $(1, 2) \cup [5, \infty)$

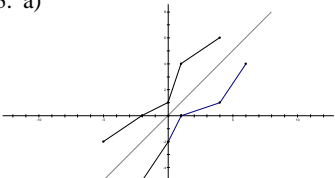
- 40. a) Yes
- b) Yes
- c) Yes
- d) No

41. a) $y = \frac{3x-5}{2}$

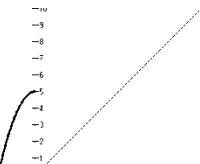
- b) $y = \frac{1-4x}{3}$
- c) $x^2 - 2, x > 0$

42. You need to show that $f(g(x)) = x$ and that $g(f(x)) = x$.

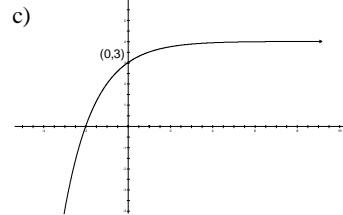
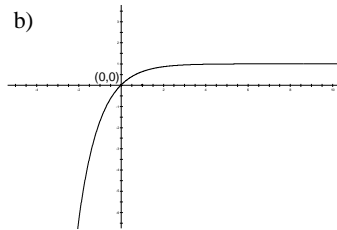
43. a)



b)



44. a)



45. \$22,099.36

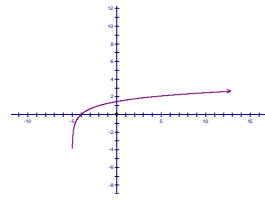
- 46. a) 5
- b) -2
- c) -4
- d) $\frac{2}{3}$
- e) $\frac{2}{3}$

47. Domain is $(-5, \infty)$

Range is $(-\infty, \infty)$

Vert. asymptote: $x = -5$

Intercept: $(-4, 0)$



48. a) $3\ln(x) + 2\ln(y) - \ln(z)$

b) $\ln(6) - 2$

c) $3 + 4\log_a b - \log_a m - \frac{5}{2}\log_a n$

49. $\ln \sqrt[3]{(x-3)^2} (x+y)$

50. a) 3 b) 50 c) $6-4x$

51. a) $\frac{1}{4}$

b) 5

c) $\frac{5}{2}$

d) $\frac{\ln 10.4}{2} \approx 1.171$

e) 6

52. $\frac{\ln 2}{8} \approx .087$

53. a) 6%

b) $A(t) = 8000e^{0.06t}$

c) \$14,577

d) $\frac{\ln 2}{0.06} \approx 11.55$ years

54. a) $k \approx -0.175$;

$$P(t) = 3395e^{-0.175t}$$

b) \$103

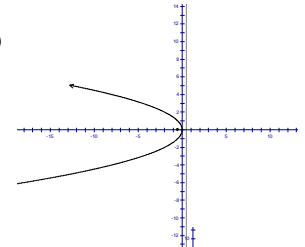
c) $\frac{\ln \frac{1}{2}}{-0.175} \approx 3.96$ years

55. a) $\sqrt{41}$ b) $4\frac{2}{3}$

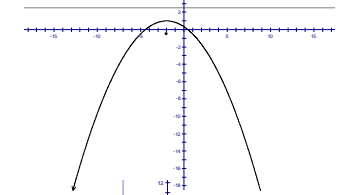
56.

	Vertex	Focus	Direct.
a)	(0,0)	$(-1/2, 0)$	$x=1/2$
b)	(-2,1)	$(-2, -1/2)$	$y=5/2$
c)	$(-\frac{17}{4}, -\frac{1}{2})$	$(-4, -1/2)$	$x = -9/2$

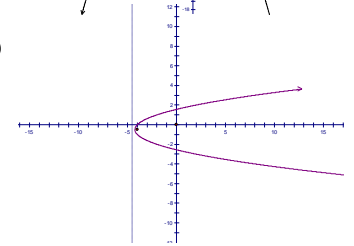
a)



b)



c)



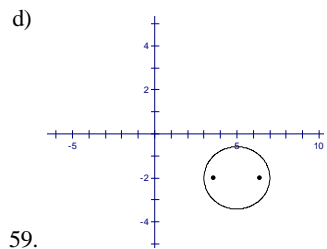
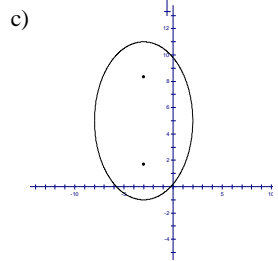
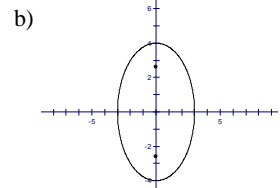
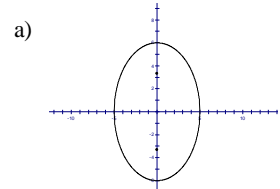
57. Center: $(-3, 5)$

Radius: $\sqrt{34}$

58.

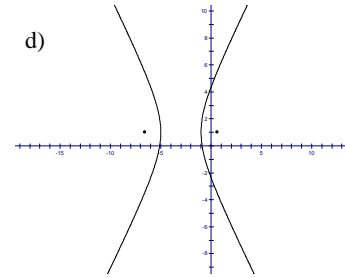
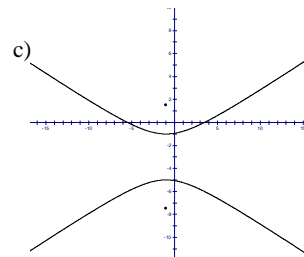
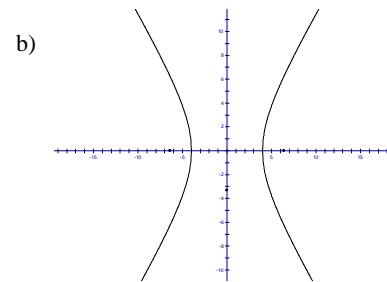
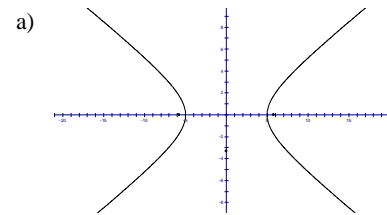
	Cntr	Vertices	Foci
a)	(0,0)	(0,6) (0,-6)	$(0, \sqrt{11})$ $(0, -\sqrt{11})$
b)	(0,0)	(0,4) (0,-4)	$(0, \sqrt{7})$ $(0, -\sqrt{7})$
c)	(-3,5)	(-3,11)	$(-3, 5 + \sqrt{11})$

	$(-3,-1)$	$(-3,5+\sqrt{11})$
d)	$(5,-2)$	$(7,-2)$
	$(3,-2)$	$(5-\sqrt{2},-2)$



59.

	<i>Cntr</i>	<i>Vertices</i>	<i>Foci</i>
a)	$(0,0)$	$(5,0)$ $(-5,0)$	$(\sqrt{34},0)$ $(-\sqrt{34},0)$
b)	$(0,0)$	$(4,0)$ $(-4,0)$	$(\sqrt{41},0)$ $(-\sqrt{41},0)$
c)	$(-1,-3)$	$(-1,-1)$ $(-1,-5)$	$(-1,-3+2\sqrt{5})$ $(-1,-3-2\sqrt{5})$
d)	$(-3,1)$	$(-5,1)$ $(-1,1)$	$(-3+\sqrt{13},1)$ $(-3-\sqrt{13},1)$



60. a) ellipse
b) hyperbola
c) parabola
d) circle
e) ellipse
f) hyperbola

61. $\frac{1}{2}$ ft or 6 in

62. 0.7 ft

63. 225

64. a) $\frac{307}{210}$

b) -52,428

65. a) $\sum_{k=1}^{\infty} 7k$

b) $\sum_{k=2}^n (-1)^k k^2$

66. -41

67. -43

68. $\frac{3}{2}$

69. 10,000

70. 136 marchers

71. a) 6561

a) 96

c) -0.0008

d) -1

72. $\frac{341}{32}$ or $10\frac{21}{32}$

73. a) $\frac{49}{4}$

b) $\frac{1000}{11}$

b) Does not exist

74. \$36,749.54

75. a) $\frac{5}{256}$ ft

b) Approximately 6.7 ft

