Name: _____ Hour: ____

Algebra 2 - End of Course Review

1. Simplify: $\sqrt{-49}$ $\boxed{7i}$

2. Simplify: $\sqrt{100}$ $\boxed{10}$

3. Simplify: $(5i)(7i)$

$35i^2 = \boxed{-35}$

4. Simplify: $3i(7i+4)$

$21i^2+12i$

$\boxed{-21+12i}$

5. Find all possible roots of: $\sqrt{x^2} = \sqrt{-121}$

$\boxed{\pm 11i}$

6. Find all the possible roots of: $x^2+13=4$

$\boxed{\pm 3i}$

$-13 \quad -13$

$\sqrt{x^2} = \sqrt{-9}$

7. Simplify: $-3a+4b+(5a+3b)-8a$

$\boxed{-16a+7b}$

8. Simplify: $-6m^2-m^3+8n^2+8m^2$

$\boxed{-m^3+2m^2+8n^2}$

9. Factor completely: $2x^2-16x+30$

$2(x^2-8x+15)$

$\boxed{2(x-3)(x-5)}$

10. Factor completely: $4x^2+4x-48$

4 | -168

-13 | -21, 8

2 | -12, 14

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

$\boxed{4(x+4)(x-3)}$

11. Factor Completely: $16x^2-36$

$(4x+6)(4x-6)$

12. Factor Completely: $3x^2-48$

$3(x^2-16)$

$3(x+4)(x-4)$

13. Solve: $0=x^2+64$

$\sqrt{-64} = \sqrt{x^2}$ $\boxed{\pm 8i}$

14. Solve: $0=2x^2+50$

$\frac{2x^2}{2} = \frac{-50}{2}$

$\sqrt{x^2} = \sqrt{-25}$

$\boxed{x = \pm 5i}$

15. Factor Completely: $3x^2+15x+12$

$3(x^2+5x+4)$

$\boxed{3(x+4)(x+1)}$

16. Factor Completely: $3x^2-21x+18$

42 | -21

6, 7

21, 2

14, 3

$3(x^2-7x+6)$

$\boxed{3(x-6)(x-1)}$

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17. How many of each type of solution (rational, irrational, and imaginary) does each of these equations have?

A) $(x^3 - 3x^2)+(9x - 27)$

$x^2(x-3)+9(x-3)$

$(x^2+9)(x-3)$

1 rational, 2 imaginary

B) $x^3 + 4x^2 - 41x - 140$ — 1 rational, 2 irrational

1	4	-41	-140
↓	-7	21	140
1	-3	-20	0

$x^2 - 3x - 20 = 0$

$\frac{3 \pm \sqrt{3^2-4(1)(-20)}}{2(1)}$ $\quad 3 \pm \sqrt{9+80}$ $\quad -7$

18. A theatre has determined that their per-item profit, P, can be modeled by the function: $P(x) = -2x^2 + 45x$, where x is the ticket price. What is the optimal ticket price and maximum profit that the theatre will make per item?

$\frac{-b}{2a} = \frac{-45}{-2(2)} = \frac{-45}{-4} =$ \$11.25 ← optimal price

$P(11.25) = -2(11.25)^2 + 45(11.25) =$ \$253.13 ← max profit

19. Given: $f(x) = \frac{3x-1}{2x^2}$ What is $f(-3)$?

$= \frac{3(-3)-1}{2(-3)^2} = \frac{-9-1}{18} = \frac{-10}{18} = \frac{-5}{9}$

For #20-23, use the following: $f(x) = 3x^2 - 7x - 10$, $g(x) = -2x - 7$ and $h(x) = 2x^2 + 5$

20. Find $(f - g)(x)$

$(3x^2-7x-10)+(+2x+7)$

$3x^2-5x-3$

21. Find $(f + g)(x)$

$(3x^2-7x-10)+(-2x-7)$

$3x^2-9x-17$

22. Find $(h \circ g)(x)$

$2(-2x-7)^2+5$

$2(4x^2+28x+49)+5$

$8x^2+56x+98+5 =$ $8x^2+56x+103$

	$-2x$	-7
$-2x$	$4x^2$	$14x$
-7	$14x$	49

23. Write the inverse function of $h(x)$.

$x = 2y^2 + 5$

$\frac{x-5}{2} = \frac{2y^2}{2}$

$h^{-1}(x) = \sqrt{\frac{x-5}{2}}$

24. Use synthetic division to determine if $(x - 4)$ is a factor of $f(x) = -x^4 + 2x^3 + 14x^2 - 30x + 24$.

4	-1	2	14	-30	24
	↓	-4	-8	24	-24
	-1	-2	6	-6	0

Yes, $(x-4)$ is a factor of $f(x)$

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25. Use synthetic division to determine if $(x+5)$ is a factor of $f(x) = x^3 + 2x^2 - 14x - 3$.

$$\begin{array}{c|cccc} -5 & 1 & 2 & -14 & -3 \\ & \downarrow & -5 & 15 & -5 \\ \hline & 1 & -3 & 1 & -8 \end{array}$$

$(x+5)$ is not a factor

26. Find all roots of: $3x^3 + 2x^2 - 3x - 2 = 0$

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

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

$(x+1)(x-1)(3x+2) = 0$

$x = \pm 1, -\frac{2}{3}$

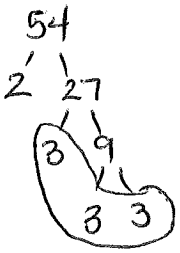
27. Find all roots of: $14x^3 - 35x^2 - 4x + 10 = 0$

$7x^2(2x-5) - 2(2x-5) = 0$

$(7x^2-2)(2x-5) = 0$

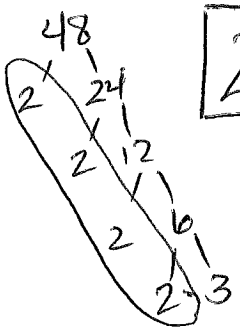
$x = \frac{5}{2}, \pm\sqrt{\frac{2}{7}}$

28. a. Simplify: $\sqrt[3]{54x^9y^{10}}$



$3x^3y^3 \cdot \sqrt[3]{2y}$

29. Simplify: $\sqrt[4]{48a^4c^{12}}$



$2ac^3 \cdot \sqrt[4]{3}$

30. Simplify and state the domain restrictions.

a. $\frac{x^2-3x-18}{x^2-7x+6} = \frac{(x-6)(x+3)}{(x-6)(x-1)}$

$\frac{x+3}{x-1}$, $x \neq 6, 1$

b. $\frac{x^3-6x^2-40x}{2x^3-32x} = \frac{x(x^2-6x-40)}{2x(x^2-16)}$

$\frac{x(x-10)(x+4)}{2x(x+4)(x-4)} = \frac{(x-10)}{2(x-4)}$

$x \neq \pm 4, 0$

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31. Robin Banks is riding a ski lift that tops out at 11,700 feet above sea level. The base of the lift is 9700 feet above sea level. It carries Robin up at 250 feet per minute. How long will it take Robin to reach the top?

$11700 - 9700 = 2000\text{ ft}$ $\quad \frac{2000}{250} = \boxed{8\text{ min}}$

32. Dr. E. Ville has a dentist practice that is open for no more than 8 hours each day. His receptionist, Louise E. Anna, schedules appointments, allowing ½ hour for a cleaning and 1 hour to fill a cavity. Write an inequality to represent the number of cleanings, c, and the number of fillings, f, that Dr. E. Ville can do in one day.

c = # of cleanings
f = # of fillings

$0.5c + f \leq 8$

33. What is the y-coordinate in the solution of the following system of equations?

$$\begin{array}{r} 6x + 3y = 3 \\ + \quad 7x - 3y = -16 \\ \hline 13x = 13 \\ x = -1 \end{array}$$

$$\begin{array}{r} 6(-1) + 3(y) = 3 \\ +6 \qquad\quad +6 \\ \hline 3y = 9 \\ \frac{3y}{3} = \frac{9}{3} \end{array}$$

$\boxed{y = 3}$

34. Solve for t: $S = 5r^2t$

$\frac{S}{5r^2} = \frac{5r^2t}{5r^2}$

$\boxed{t = \frac{S}{5r^2}}$

35. Solve for x: $|4x + 2| = 6$

$4x + 2 = 6$ $\quad -2 \quad -2$

$4x = 4$

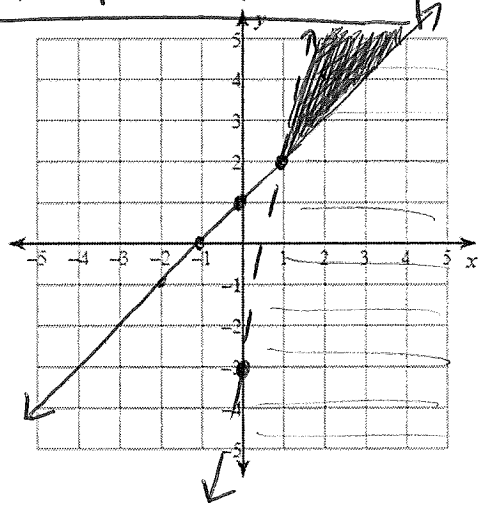
$4x + 2 = -6$ $\quad -2 \quad -2$

$4x = -8$

$\boxed{x = 1 \text{ and } -2}$

36. Graph the system of inequalities

$$\begin{cases} y < 5x - 3 \\ y \geq x + 1 \end{cases}$$



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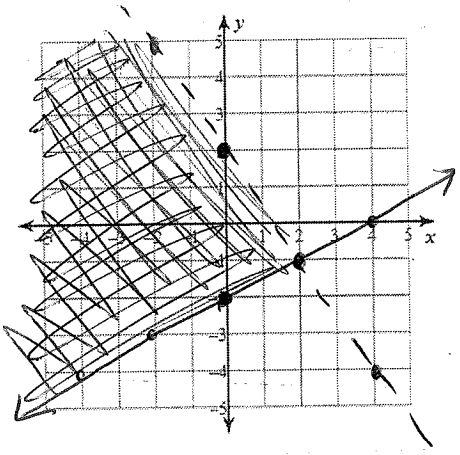
37. Graph the system of inequalities

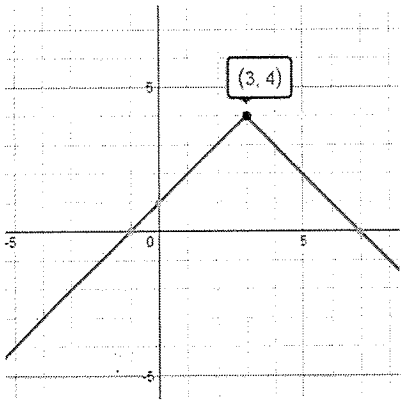
$y \geq x + 1$

$y \leq 5x - 3$

$\begin{cases} y < -\frac{3}{2}x + 2 \\ y \geq \frac{1}{2}x - 2 \end{cases}$

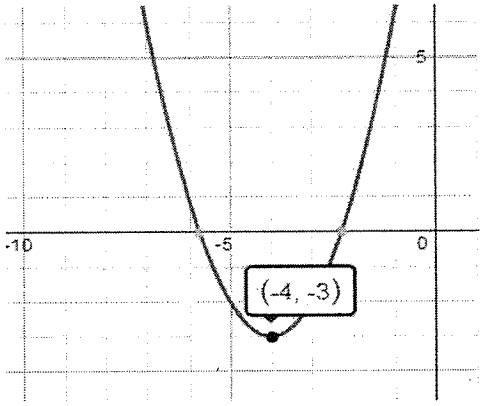


38. Write an equation to represent the transformations of the absolute value graph shown.



$f(x) = -|x-3| + 4$

39. Write an equation to represent the transformations of the parabola.



$f(x) = (x+4)^2 - 3$

40. Solve for x: $\sqrt{x-5} = 7$

$x - 5 = 49$

$+5 \quad +5$

$x = 54$

41. Solve for a: $5 + \sqrt{a-7} = 6$

$-5 \quad -5$

$\sqrt{a-7} = 1$

$a - 7 = 1$

$+7 \quad +7$

$a = 8$

42. Find the solutions and identify any extraneous solutions.

a. $\left(\sqrt{3-x}\right)^2 = (x-3)^2$

$3 - x = x^2 - 6x + 9$

$-3 + x \quad +x \quad -3$

$0 = x^2 - 5x + 6$

$0 = (x-3)(x-2)$

$x = 2, 3$ $x = 3$

b. $9 + \sqrt{b-9} = b$.

$-9 \quad -9$

$\sqrt{b-9} = b - 9$

$b - 9 = b^2 - 18b + 81$

$-b + 9 \quad -b \quad +9$

$0 = b^2 - 19b + 90$

$0 = (b-9)(b-10)$

$b = 9, 10$

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43. Solve for a: $\frac{6}{a^2+a} + \frac{1}{a} = \frac{4}{a^2+a}$

$\frac{6}{a(a+1)} + \frac{a+1}{a(a+1)} = \frac{4}{a(a+1)}$

$a+7=4$

$\boxed{a=-3}$

44. Solve for k: $1 = \frac{6k-1}{k} + \frac{k+2}{k}$

$\frac{K}{K} = \frac{6k-1}{k} + \frac{k+2}{K}$

$K = 6k-1+k+2$

$K = 7k+1$

$-6k = 1$

$\boxed{k = \frac{-1}{6}}$

45. Identify whether the graph of the parabola opens up/down and has a max/min. Find the equation for the axis of symmetry and the vertex.

a. $f(x) = (x+5)^2 - 2$

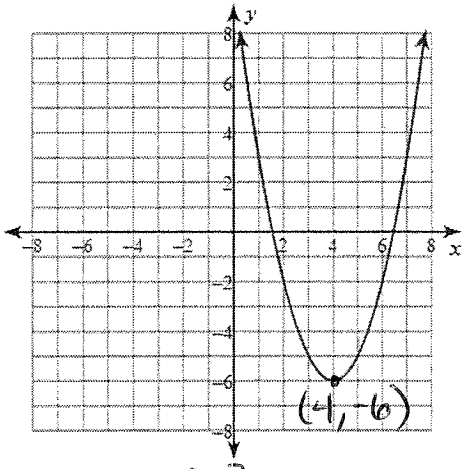
opens up
has a min
vertex: $(-5, -2)$
aos: $x = -5$

b. $f(x) = -(x+2)^2$

opens down
has a max
vertex: $(-2, 0)$
aos: $x = -2$

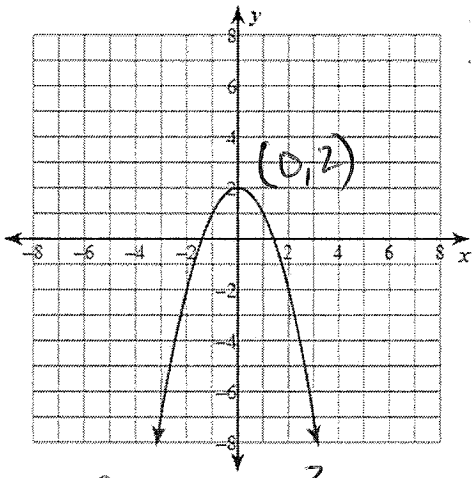
46. Write the equation of each graph.

a.



$f(x) = (x-4)^2 - 6$

b.



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

47. Identify the zeros, vertical and horizontal asymptotes, and domain of: $f(x) = \frac{2x^2+4x-6}{x^2+7x+10}$

Zeros → $x=1$, $x=-3$
VA: $x=-5$, $x=-2$
HA: $y=2$
Domain: $x \neq -2, -5$

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

$= \frac{2(x-1)(x+3)}{(x+5)(x+2)}$

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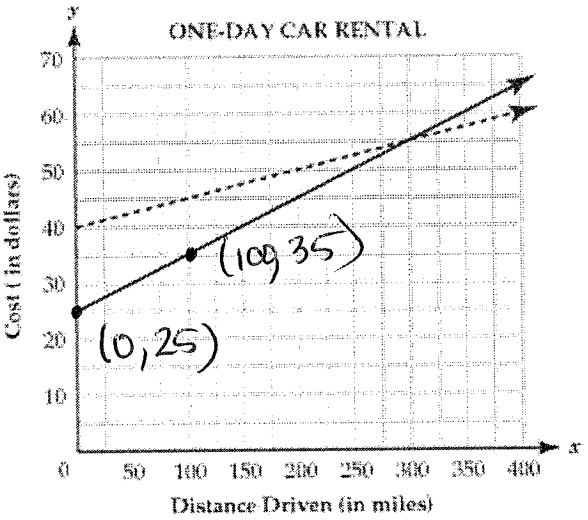
48. What is the cost per mile (signified by the solid line) of renting a car in the graph below?

$\frac{35-25}{100-0} = \frac{10}{100} =$ **$\frac{\$0.10}{1 \text{ mile}}$**



49. Which of the following has a negative slope?

A) $5x - 10y = 20 \rightarrow y = \frac{1}{2}x - 2$

B) $f(x) = 30 - x = -x + 30$

C) $\frac{-y}{-1} = \frac{-\frac{2}{3}x}{-1} + \frac{7}{-1} \rightarrow y = \frac{2}{3}x - 7$

D)

x	y
-2	-4
-1	-2
0	0
1	2
2	4

50. State the domain and the range of the function, $f(x) = -3x^2 + 3$

Range: $y \leq 3$

Domain: all IR's

vertex: (0, 3) → opens down

51. Given: $f(x) = x^2 + 5$ and $g(x) = 2x + 3$. Find $f(g(x))$.

$(2x+3)^2 + 5$

$4x^2 + 12x + 9 + 5$

$4x^2 + 12x + 14$

52. Given $f(x) = \frac{1}{4}x - 5$, find $f^{-1}(x)$.

$x = \frac{1}{4}y - 5$

$4(x+5)$

$f^{-1}(x) = 4x + 20$

53. Use the formula: $A = P(1 + \frac{r}{n})^{nt}$ to find the amount of money an account will have if you started with \$5000 and it earns 3.2% interest and it is compounded semiannually for 15 years.

$A = 5000\left(1 + \frac{.032}{2}\right)^{30}$

\$8,049.73

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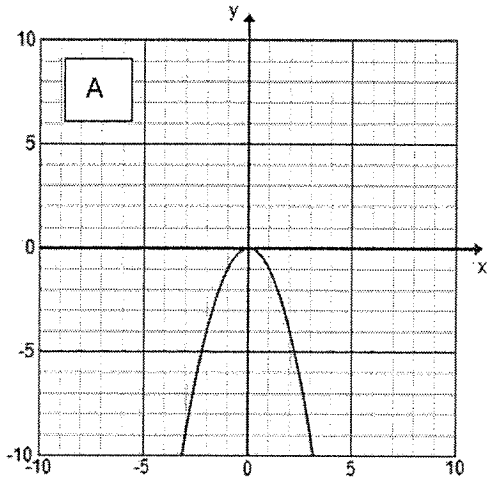
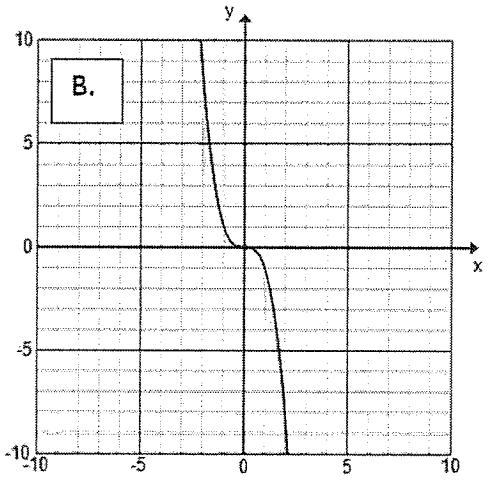
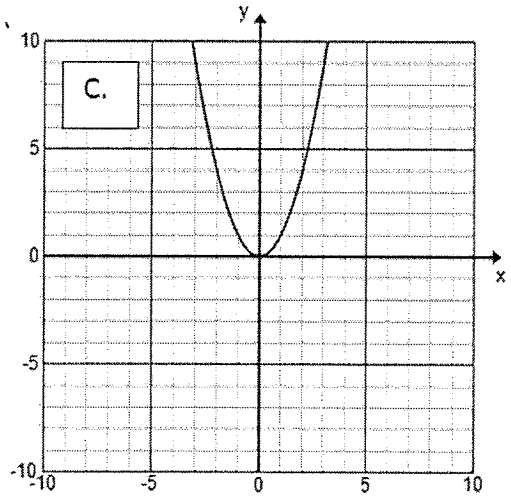
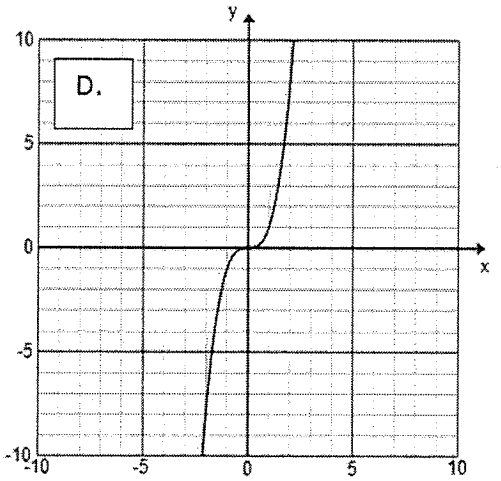
54. Which graph has the following properties: has 1 solution, a maximum but no minimum, a negative leading coefficient, and an even degree?

A









55. Write in logarithmic form: $3^7 = 2187$

$\log_3 2187 = 7$

56. Evaluate: $\log_4 1024$.

$4^x = 1024$

$x = 5$

$\frac{\log 1024}{\log 4}$

57. Evaluate: $\log_3 \frac{1}{9}$.

$3^x = \frac{1}{9}$

$x = -2$

58. Solve: $\log 25 = \log 5x - \log 10$

$\log 25 = \log \frac{5x}{10}$

$25 = \frac{x}{2}$

$x = 50$

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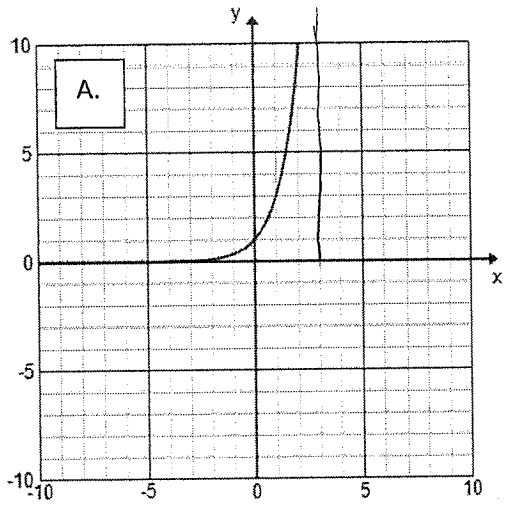
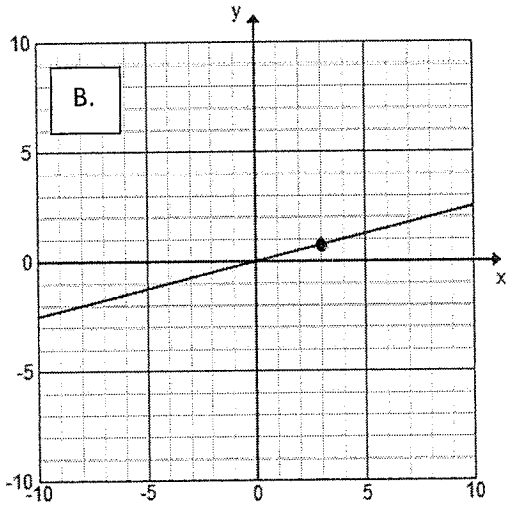
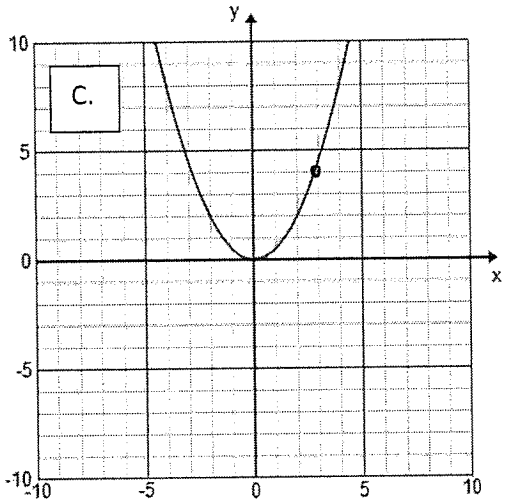
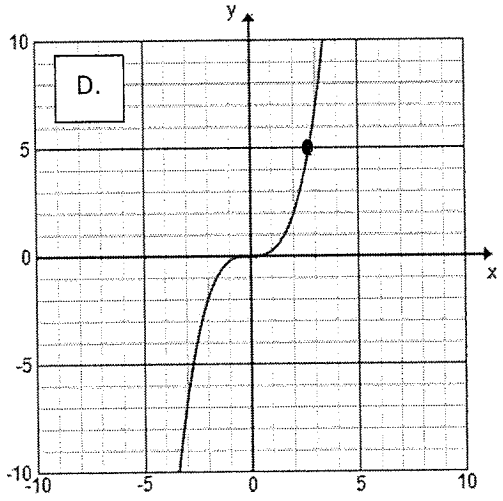
59. Which graph shown below has a higher value at $x = 3$?

A









60. Solve: $\log 25 = \log x + \log x$

$25 = x^2$

$x = 5$

61. Simplify: $(-2x^3y^5h^7)^5$

$-32x^{15}y^{25}h^{35}$

62. Simplify: $(-2a^{-2}b^5)(7a^4b^{-3})$

$-14a^2b^2$

63. Simplify: $3a^3b^{-2}c^{-1}$

$\frac{3a^3}{b^2c}$