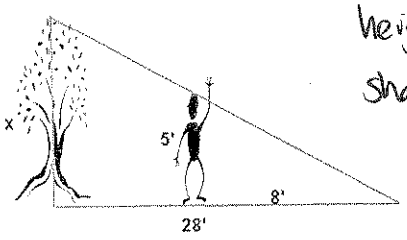
1. At a certain time of the day, the shadow of a 5' boy is 8' long. The shadow of a tree at this same time is 28' long. How tall is the tree?



height / shadow $\frac{5}{8} = \frac{x}{28}$

$\frac{8x}{8} = \frac{140}{8}$

$x = 17.5$ ft

~ means $\cong$ sides proportional

2. Find x and y if $\triangle ABC \sim \triangle PQR$, $m\angle R = 10x + 140$, $m\angle C = 48x - 50$, $m\angle P = 8y - 9$, $m\angle A = x + y$.

$10x + 140 = 48x - 50$

$-48x \quad -140 \quad -48x \quad -140$

$\frac{-38x}{-38} = \frac{-190}{-38}$

$x = 5$

$8y - 9 = x + y$

$-y \qquad -y$

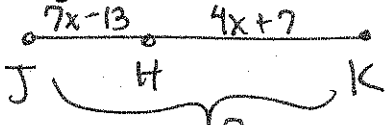
$7y - 9 = x$

$7y - 9 = 5$

$7y = 14$

$y = 2$

3. Given that H is between J and K, JK = 71, JH = 7x - 13, and HK = 4x + 7, find the value of x, the length of JH, and the length of HK.



$JH + HK = JK$

$7x - 13 + 4x + 7 = 71$

$11x - 6 = 71$

$11x = 77$

$x = 7$

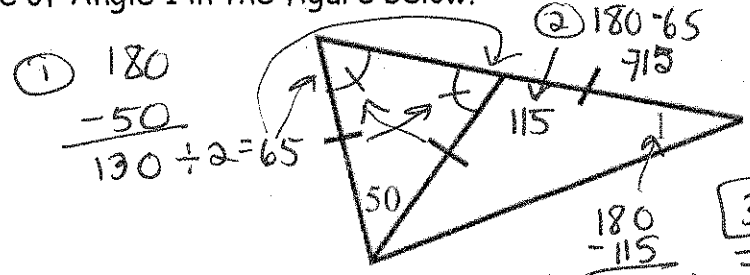
$JH = 7(7) - 13$

$JH = 36$

$HK = 4(7) + 7$

$HK = 35$

4. Find the measure of Angle 1 in the figure below.



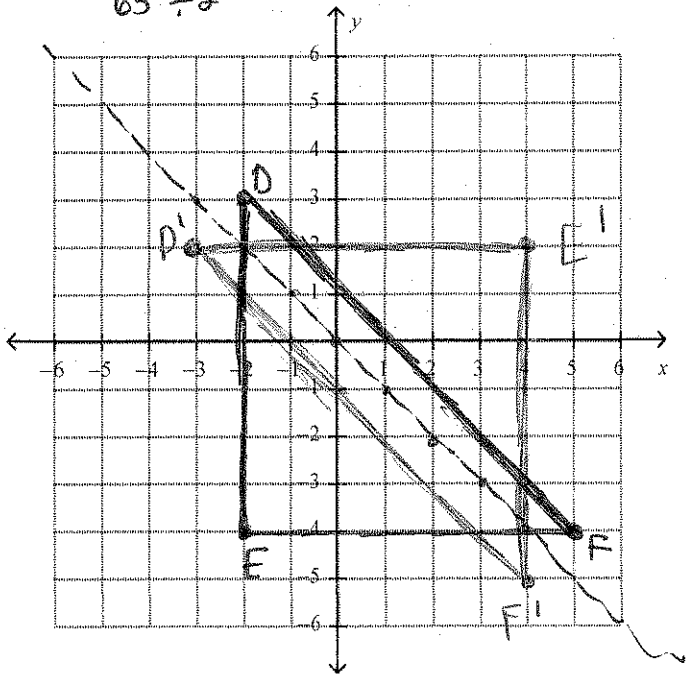
① $180 - 50 = 130$, $130 \div 2 = 65$

② $180 - 65 = 115$

$180 - 115 = 65$, $65 \div 2 = 32.5$

5. The vertices of a triangle are D(-2, 3), E(-2, -4) and F(5, -4). Graph and label the image with a reflection over the line y = –x. Name the image vertices below.

$y = -1x + 0$



D' (-3, 2) E' (4, 2) F' (4, -5)

x & y vertices "switched places" and got opposite signs

Write the algebraic rule for a reflection over y = –x.

$(x, y) \rightarrow (-y, -x)$

6. Sketch the graph of the function on a separate piece of paper. $y = x^2 + 15x + 54$

a. *Find the x-intercepts.* y = roots = zeros → (-9, 0) (-6, 0)

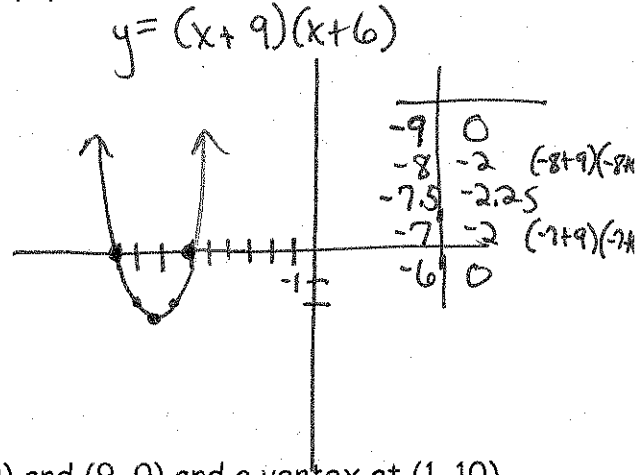
b. *Find the axis of symmetry.* $\frac{-9+-6}{2} = \frac{-15}{2} = -7.5$ → $x = -7.5$

c. *Find the vertex.* $y = (-7.5)^2 + 15(-7.5) + 54 = -2.25$ → (-7.5, -2.25)

d. *Find the y-intercept.* $y = 0^2 + 15(0) + 54$ → (0, 54)

e. *Is the vertex a max or a min?* min $a = 1$ → positive so smile parabola

$y = (x+9)(x+6)$



7. Find the equation of a function with intercepts at (-5, 0) and (9, 0) and a vertex at (1, 10)

QuadReg OR

$y = a(x+5)(x-9)$ ← do (x - root) to get factors

$10 = a(1+5)(1-9)$

$10 = a(6)(-8)$

$\frac{10}{-48} = \frac{a(-48)}{-48}$ → $a = \frac{-5}{24}$

$y = \frac{-5}{24}(x+5)(x-9)$ factored form

$y = \frac{-5}{24}(x^2 - 4x - 45)$

$y = \frac{-5}{24}x^2 + \frac{5}{6}x + \frac{75}{8}$ standard form

Find the discriminant and tell the number/type of solutions.

8. $16b^2 - 40b + 25 = 0$ → $b^2 - 4ac$

$(-40)^2 - 4(16)(25)$

discr: 0 → 1 real root rational because discr 0

9. $x^2 - 4x + 24 = 0$

$(-4)^2 - 4(1)(24)$

$16 - 96$

discr: -80 → 2 imaginary roots

10. $6k^2 + 5k - 6 = 0$

$5^2 - 4(6)(-6)$

$25 + 144$

discr: 169 → 2 real rational root because discr perfect square the 2 roots are rational

Quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

11. Solve: $6 - \sqrt[3]{1-7u} = 2$

$-6 \quad -6$

$-\sqrt[3]{1-7u} = -4$

$\sqrt[3]{1-7u} = 4$

$(\sqrt[3]{1-7u})^3 = 4^3$

$1 - 7u = 64$

$-7u = 63$

$u = -9$ ✓ $6 - \sqrt[3]{1-7(-9)} = 2$ ✓

12. Solve the equation $25^{2x+1} = 144$

$\log 25^{2x+1} = \log 144$

power property: $(2x+1)\log 25 = \log 144$

$\frac{(2x+1)\log 25}{\log 25} = \frac{\log 144}{\log 25}$

$2x + 1 = \frac{\log 144}{\log 25}$

$2x = \frac{\log 144}{\log 25} - 1$

$x = \frac{\log 144}{2\log 25} - \frac{1}{2}$

.2720

13. In 2005, a baseball card bought for $50 increased at a rate of 3.4% per year.

a. Write an exponential function that models the value of the baseball card.

$b = 1 + r$ (use + for increasing rate) $b = 1 + .034$ $y = 50(1.034)^x$

b. Write a recursive (NOW-NEXT) function to model the data.

next = 1.034 * now ; Start = 50

c. Find the value of the baseball card in 2013.

$x = 8$ $y = 50(1.034)^8$ $65.33

d. In what year will the baseball card be worth $120?

$y_2 = 120$ OR $y_1 = 50(1.034)^x$ & intersect $120 = 50(1.034)^x$ $\frac{120}{50} = 1.034^x$

$\log\left(\frac{120}{50}\right) = \log(1.034)^x$ $\log\left(\frac{120}{50}\right) = x\log(1.034)$ $\frac{\log(\frac{120}{50})}{\log(1.034)} = \frac{x\log(1.034)}{\log(1.034)}$ $x = 26.18$ $+ 2005$ 2031.18 2031

14. A car's original value when purchased was $18,000. Five years later, it was worth $7,500. Find an exponential equation to model the information. Then, find the value of the car ten years after the purchase.

(0, 18000) (5, 7500) $y = y_1 \cdot b^{x_1}$ $\frac{7500}{18000} = \frac{18000 \cdot b^5}{18000}$ $\sqrt[5]{.416} = \sqrt[5]{b^5}$ $.8394 = b$

$y = 18000(.8394)^x$ (b = decay factor; starting amount at time zero)

$y = 18000(.8394)^{10}$ $3125

15. Find the inverse of

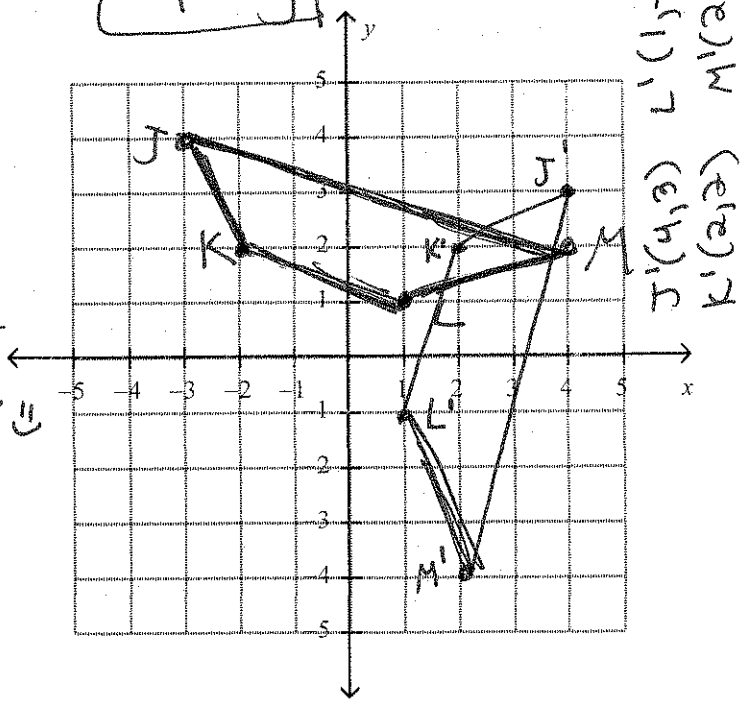
a. $f(x) = \sqrt{x-6}$. $y = \sqrt{x-6}$

to do inverse, switch places of x + y then solve for y

$x = \sqrt{y-6}$ $x^2 = y - 6$ $x^2 + 6 = y$

b. y = 4x + 7. $x = 4y + 7$ $x - 7 = 4y$ $\frac{x-7}{4} = y$ or $y = \frac{1}{4}x - \frac{7}{4}$

16. Graph and label the points J(-3, 4), K(-2, 2), L(1, 1) and M(4, 2) and then rotate the figure 270°. Graph and label the image points, and write their coordinates below. Then, write the algebraic rule for the transformation.



J(-3, 4) K(-2, 2) L(1, 1) M(4, 2)

Standard is counterclockwise => Remember, each twist of paper is 90° ☺

J' (4, 3) K' (2, 2)

L' (1, -1) M' (2, -4)

Write the algebraic rule for the rotation 270°:

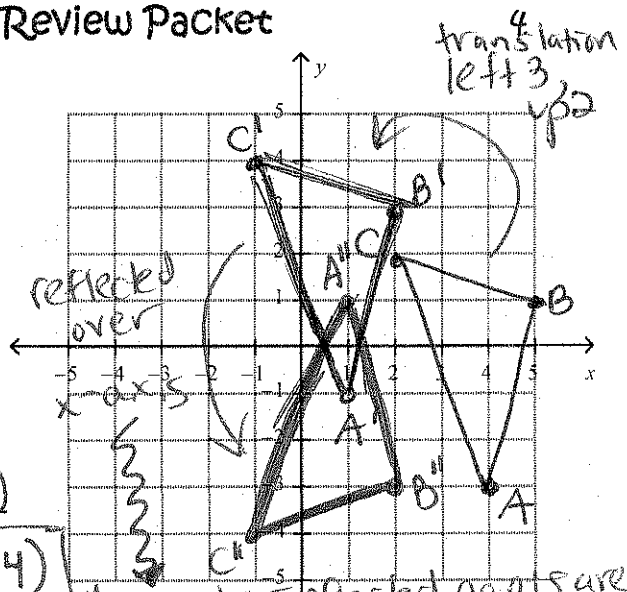
$(x, y) \rightarrow (y, -x)$

because x and y coordinates switched places and the back one switched signs

Honors CCM2 — 1st Quarter Exam Review Packet

17. Graph $\triangle ABC$ with A(4, -3), B(5, 1), and C(2, 2), then graph the image of $\triangle ABC$ after the translation $(x, y) \rightarrow (x - 3, y + 2)$, then a reflection over the x-axis. left 3, up 2

Label all your points then, write the coordinates of the final image below.



left 3, up 2 → Image $A'(1,-1)$, $B'(2,3)$, $C'(-1,4)$

THEN reflect over y-axis → Final Image $A''(1,1)$ $B''(2,-3)$ $C''(-1,-4)$

*remember reflected points are equidistant from the mirror line!

18. $\triangle SAM \cong \triangle LET$. If $SA = x^2 - 4x$, $LE = 5x - 18$ and $ET = 24$. Find SA.

$\overline{SA} \cong \overline{LE}$

$x^2 - 4x = 5x - 18$

$x^2 - 4x - 5x + 18 = 0$

$x^2 - 9x + 18 = 0$

$(x - 6)(x - 3) = 0$

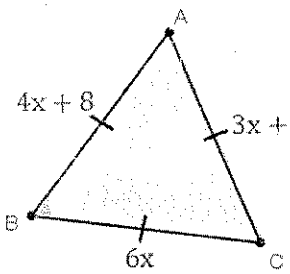
$x = 6, 3$ (because 3 gives negative length)

$SA = (6)^2 - 4(6) = 36 - 24 = 12$

$SA = (3)^2 - 4(3) = 9 - 12 = -3$

SA = 12

19. Find the value of x.



$4x + 8 = 3x + 12$

$x = 4$

$6x = 4x + 8$

$2x = 8$

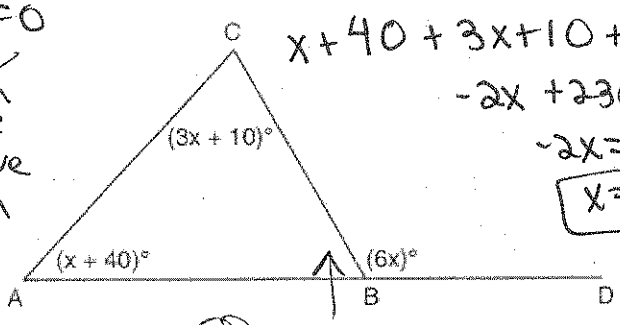
$x = 4$

$6x = 3x + 12$

$3x = 12$

$x = 4$

20. Find the value of x.



$x + 40 + 3x + 10 + 180 - 6x = 180$

$-2x + 230 = 180$

$-2x = -50$

$x = 25$

① $180 - 6x$ (supplementary angles because linear pairs)

21. Describe how the parabola $y = -(x - 5)^2 + 6$ is shifted from $y = x^2$.

reflected over x-axis, right 5, up 6

reflected over x-axis, right 5, up 6

Factor and find the solutions.

22. $2v^2 + 5v + 2 = 0$

$4 \cdot 1 = 4$

$4 + 1 = 5$

$2v^2 + 4v + 1v + 2 = 0$

$2v(v + 2) + 1(v + 2) = 0$

$(2v + 1)(v + 2) = 0$ ← factored

$2v + 1 = 0$ $v + 2 = 0$

$v = -1/2, v = -2$ ← solutions

23. $5a^2 - 18a + 9 = 0$

$-15 \cdot -3 = 45$

$-15 + -3 = -18$

$5a^2 - 15a - 3a + 9 = 0$

$5a(a - 3) - 3(a - 3) = 0$

$(5a - 3)(a - 3) = 0$ ← factored

$5a - 3 = 0$ $a - 3 = 0$

$a = 3/5, a = 3$ ← solutions

Factor and find the solutions.

24. $4b^2 - 35b + 49 = 0$

$4b^2 - 7b - 28b + 49 = 0$

$b(4b-7) - 7(4b-7) = 0$

$(b-7)(4b-7) = 0$ ← factored

$b-7=0$, $4b-7=0$

$b = 7$, $b = 7/4$

$-7 \cdot -28 = 196$ ☆ Remember Calculator trick

$-7 + -28 = -35$

$y_1 = 196/x$

then look in table for 2 side-by-side values (integers only) with sum of -35

25. The following function models how much money, v, a certain company makes after a certain amount of time, t. At what time did they make the least amount of money?

$v(t) = 5000 + 360t - 12t^2$

$y_1 =$

Do in calc... find value → 2nd Trace 2:zero

$x = 40.33 = t$

made $0

max is at vertex (15, 7700)

26. Iodine-131 is used to find leaks in water pipes. It has a half life of 8.14 days.

a. Write an exponential function for a 200 mg sample.

$y = 200(1/2)^{t/8.14}$

$y = \text{starting amount}(1/2)^{t/\text{halflife time}}$

b. Find the amount of iodine-131 remaining after 72 days.

$y = 200(1/2)^{72/8.14}$ .435 mg

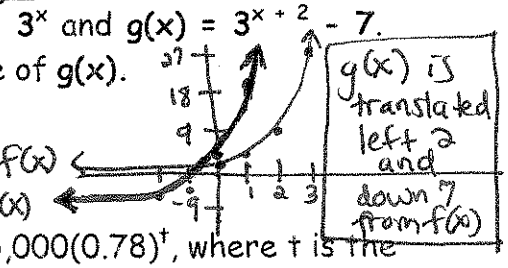
27. On a separate sheet of graph paper, graph and compare $f(x) = 3^x$ and $g(x) = 3^{x+2} - 7$. Label each graph. Determine the domain, range, and asymptote of $g(x)$.

x	f(x)
0	1
1	3
2	9
3	27

x	g(x)
-2	-6
-1	-4
0	2
1	20

f(x) D: all reals; R: $y > 0$ HA: $y = 0$

g(x) D: all reals; R: $y > -7$ HA: $y = -7$



g(x) is translated left 2 and down 7 from f(x)

28. The value, V, of a car can be modeled by the function $V(t) = 15{,}000(0.78)^t$, where t is the number of years since the car was purchased. To the nearest tenth of a percent, what is the monthly rate of depreciation?

$y = y_1 \cdot b^{x-x_1}$

$V(0) = 15000(0.78)^0 = 15000$

↳ (0, 15000) ← also find from coefficient = starting value

(0, 15000)

$V(1) = 15000(0.78)^1 = 11700$

↳ (1, 11700) = value of car after 1 year

(12, 11700) ← change to 12 for 12 months = 1 year

$11700 = 15000 \cdot b^{12-0}$

$\frac{11700}{15000} = b^{12}$

$\sqrt[12]{.78} = \sqrt[12]{b^{12}}$

$b = .9795$

$b = 1 - r$ (minus because decr)

$.9795 = 1 - r$

$-1 \quad -1$

$-.0205 = -r$

$r = .0205$

2.05%

2.1%

29. Solve $\sqrt{2x+4} = 3 + \sqrt{x-5}$

$\left(\sqrt{2x+4}\right)^2 = \left(3 + \sqrt{x-5}\right)^2$

$2x+4 = (3+\sqrt{x-5})(3+\sqrt{x-5})$

$2x+4 = 9 + 6\sqrt{x-5} + (\sqrt{x-5})^2$

$2x+4 = 9 + 6\sqrt{x-5} + x - 5$

$2x+4 = 4 + 6\sqrt{x-5} + x$

$-x \quad -4 \quad -4$

$\frac{x}{6} = \frac{6\sqrt{x-5}}{6}$

$-x$

$\left(\frac{x}{6}\right)^2 = \left(\sqrt{x-5}\right)^2$

$\frac{x^2}{36} = x - 5$

$x^2 = 36x - 180$

$x^2 - 36x + 180 = 0$

$(x-30)(x-6)$

$x = 30 \quad x = 6$ ✓ ✓

30. Simplify

$$\frac{(16)^{4/3}(x^{1/4})^{4/3}(y^{-12})^{4/3}}{(x^{-1/4})^{4/3}(y^6)^{4/3}}\left(\frac{16x^{\frac{1}{4}}y^{-12}}{x^{\frac{-1}{4}}y^6}\right)^{\frac{4}{3}}$$

power to power ⇒ multiply exponents

$$\frac{(16)^{4/3}x^{1/3}y^{-16}}{x^{-1/3}y^8}$$

division ⇒ subtract exp

$(16)^{4/3}x^{2/3}y^{-24}$ → negative exp ⇒ "move it + lose it"

$$\frac{(16)^{4/3}x^{2/3}}{y^{24}}$$