Final Review Problems

1. Jill is on a vacation and she rents a car for $49.50 per day, plus a fixed $30 insurance fee.

   A. Fill in the table with the **total** rental cost after h hours.

   B. Write an equation the gives the **total** rental fees for the car in terms of the number of days Jill rented it.

   $$R = 49.50D + 30$$

   C. If she paid $400, how long did she rent the car?

   $$D = 7.5 \text{ Days}$$

   | Days, D | Rental fee, R |
   |---------|---------------|
   | 1 | $79.50 |
   | 3 | $178.50 |
   | 5 | $277.50 |
   | 8 | $426 |

   D. Find the vertical-intercept of the equation. Use a complete sentence to explain what this point represents in the problem situation.

   At 0 Day there is a Fixed Cost of $30.

   E. Sketch a graph for this problem situation and list an appropriate viewing window on the calculator.

   Xmin = 0        Ymin = 0

   Xmax = 10       Ymax = 500
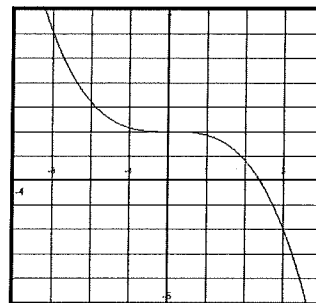
   Xscl = 1        Yscl = 50
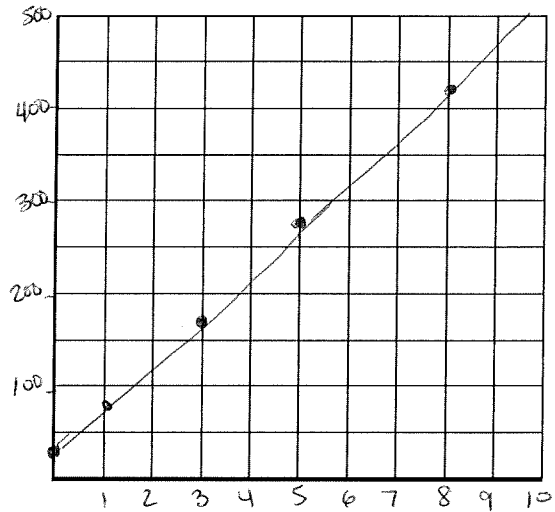
   

2. Given the graph of H(t) as shown (the scale is 1 unit on both axes), approximate the following.

   A. H(-3) = 6

   B. For what value(s) is H(t) = 1?  t = 2

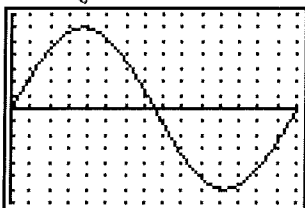   C. What is the horizontal x-int intercept?  (2.4, 0)

   

3. If $f(x) = x^2 + 5$ and $g(x) = 3x + 2$, then find:

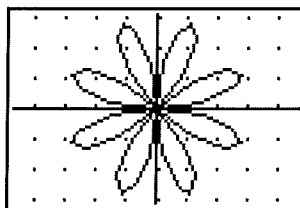   A. $(fg)(2) = (x^2+5)(3x+2) = 3x^3 + 2x^2 + 15x + 10$

   B. $(f + g)(x) = x^2 + 3x + 7$

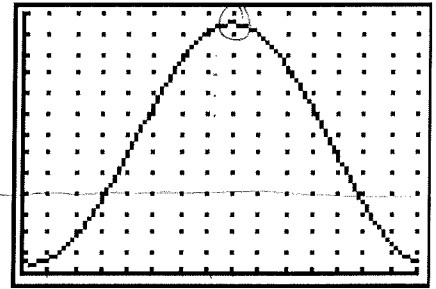4. Are the following graphs of functions?

   A.  Yes

   

   B.  NO

   

5. The graph shows S as a function of w.  s represents the weekly sales of a best-selling book, in thousands of dollars, w weeks after it is released.

   A. In which weeks were sales over $8000?  $w = 3, 13$

   B. Approximately, what week had the highest sales?
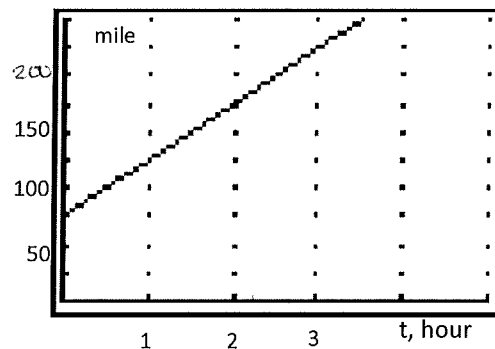
      _8_ What were the sales that week?  $25,000

   C. Find S(3) and explain what this represents in the context of the problem.

   $8000  * In 3 week, the sales were $8000.

6. The graph below shows number of miles a driver is from home after t hours.

   a) Find the slope of the line.  Mark the points you used on the graph.   $\frac{100}{2} = \boxed{50}$    $(0, 75)$  $(2, 175)$

   b) Interpret the slope in the context of the problem.

   50 miles per hour

   c) Write the equation of the line.

   $M = 50t + 75$

7. I went to the store and bought three packages of bacon and two cartons of eggs and paid a total of $11.10.  My husband, not knowing that I had already gone to the store, went to the same store and bought 2 packages of bacon and 3 cartons of eggs and paid $9.40.

   a) Define the variables and set up a system of equations to find the cost of a carton of eggs and the cost of a package of bacon.    $3 \to -2(3a + 2b = 11.10)$
   $-2 \to 3(2a + 3b = 9.40)$

   $a = bacon$
   $b = eggs$

   b) Solve the system using any method.  Show all work.

   $b = \frac{6}{5}$       $-6a - 4b = -22.20$          $9a + 6b = 33.30$         $a = 2.90$ bacon
   $b = 1.2$       $\underline{6a + 9b = 28.20}$       $\underline{-4a - 6b = -18.80}$    $b = $1.20$ eggs
                        $5b = 6$                 $5a = 14.5$
                                                 $a = 2.9$
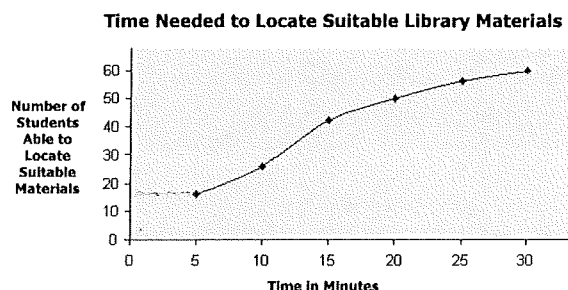
8. Given the function y = f(x - 13) + 7, explain how this graph will vary from the graph of f(x).
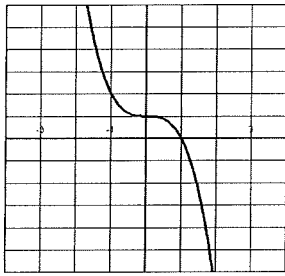
   $\to 13, \uparrow 7$

9. The graph shows the number of students who can find suitable research materials given a particular amount of time in the library.  Find the domain and range.
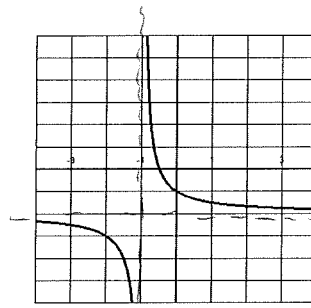
   Domain: $[5, 30]$

   Range: $[18, 60]$

Time Needed to Locate Suitable Library Materials
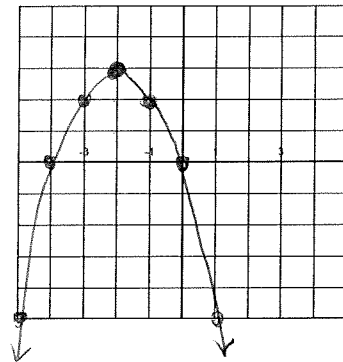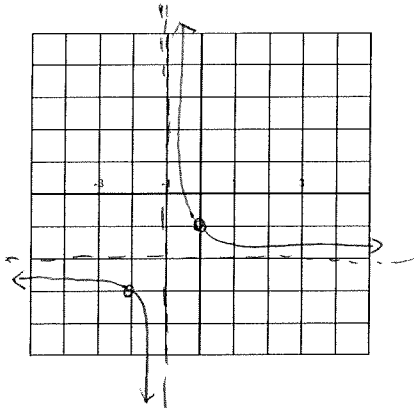
10. Write the equations of the graphs shown.

$y = -x^3 + 1$

$y = \dfrac{1}{x+1} - 2$

11. Sketch graphs of the following: $f(x) = \dfrac{1}{(x+1)^2} - 2$     $f(x) = -(x+2)^2 + 3$

12. Simplify.

A) $(-5ab^8)^3 = \boxed{-125a^3b^{24}}$   B) $\dfrac{2a^3b}{8a^4b^5} = \boxed{\dfrac{1}{4ab^4}}$   C) $\sqrt[3]{24x^{10}} = \boxed{2x^3\sqrt[3]{3x}}$

13. Perform the indicated operation and simplify if possible.

A) $\dfrac{4x^3 - 36x^2}{6x^2 + 18x}$  $\dfrac{4x^2(x-9)}{6x(x+3)}$  $\boxed{\dfrac{2x(x-9)}{3(x+3)}}$

B) $\dfrac{m^2 - m - 6}{m^2 + 5m - 14} \div \dfrac{m^2 - 9}{m + 7}$  $\boxed{\dfrac{m+2}{(m-2)(m+3)}}$

$\dfrac{(m-3)(m+2)}{(m+7)(m-2)} \cdot \dfrac{(m+7)}{(m-3)(m+3)}$

C) $\dfrac{2^{(y-3)}}{2y+6} + \dfrac{3y}{y^2-9} \cdot 2$

$2y - 6 + 6y = 8y - 6$

$2(y-3)(y+3)$

$= \dfrac{2(4y-3)}{2(y-3)(y+3)}$

$\dfrac{2(y-3)}{2(y+3)} \quad \dfrac{2(y-3)(y+3)}{(y-3)} \quad = \boxed{\dfrac{4y-3}{(y-3)(y+3)}}$

14. Rewrite $4^{1/6} = 1.26$ in logarithmic form. $\log_4 1.26 = 1/6$

15. A certain medication has a half-life of 8 hours after being taken. You take an initial dose of 500mg.

A) Write an equation for the amount of medication in your system after t hours.

$P = 500 \left(\tfrac{1}{2}\right)^{t/8}$

B) You must take another dose when the amount of medication drops below 50 mg. How long should you wait to take the next dose? $50 = 500\left(\tfrac{1}{2}\right)^{t/8}$

$t \approx 26.57$

about 26.6 hours

16. A car's value, in dollars, after t years is given by the exponential function, $V(t) = 32000\left(\dfrac{4}{5}\right)^t$.

A) What is the original value of the car? (or, what was its value when brand new?)

$\$32000$

B) What will the car be worth after 4 years?

$\$13107.20$

C) What will the car be worth half of its original value?

$.5 = \left(\tfrac{4}{5}\right)^t$     $t \approx 3.106$ yrs.

17. Subtract: $(7x^3 - 5x^2 + 11) - (4x^3 + 3x^2 - 8)$ _____

$\boxed{3x^3 - 8x^2 + 19}$

18. Multiply and simplify: $(7t + 5)(2t - 3)$   $14t^2 - 21t$   $\boxed{14t^2 - 11t - 15}$
$+ 10t - 15$

19. Multiply: $(3 + 4i)(2 - 5i)$   $6 - 15i$   $\boxed{26 - 7i}$
$+ 8i - 20i^2$

20. Completely factor the following:

a. $24a^3b^4 - 18a^2b^3 + 12ab^2$

$6ab^2(4a^2b^2 - 3ab + 2)$   $\overset{8}{\underset{2\cdot4}{\wedge}}$   $\boxed{6ab^2(4a^2b^2 - 3ab + 2)}$

b. $6t^2 + 11t + 4$   $\overset{24}{\underset{8\cdot3}{\wedge}}$   $\boxed{(2t+1)(3t+4)}$

$(2t + 1)(3t + 4)$

21. Solve using the quadratic formula: $4x^2 - 3x + 2 = 0$
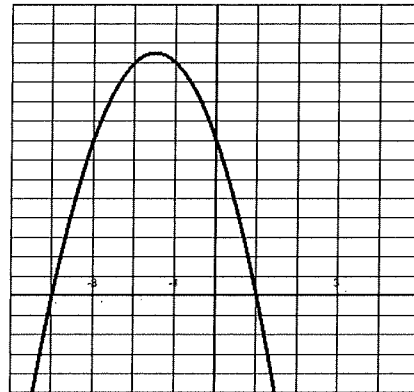
*Imaginary solutions*   $\boxed{x = \dfrac{3 \pm i\sqrt{23}}{8}}$   $\dfrac{3 \pm \sqrt{9 - 4(4)(2)}}{2(4)}$

22. Given the graph shown:

a. The y-intercept is ___8___.

b. The x-intercepts are ___-4, 1___.



c. Find the equation of the graph.

$y = a(x+4)(x-1)$   $\boxed{y = -2(x+4)(x-1)}$
$8 = a(4)(-1)$
$-2 = a$

23. A toy rocket is shot upward and then falls to the ground. The height, in feet, of the rocket is given by the equation $y = -16t^2 + 50t + 3$, where t is in seconds.

a. What is the y-intercept of the graph? Interpret what this point means in the context of the problem.

3   at 0 seconds the rocket is 3ft off the ground

b. At what time does the rocket hit the ground? Explain or show how you got your answer.

when $x = 3.184$ seconds   Graph $y_1 = -16t^2 + 50t + 3$   Interception
$y_2 = 0$

C. What is the maximum height the rocket reaches? At what time does it reach its maximum height?

$\dfrac{-50}{2(-16)} = (1.5625, 42.0625)$ ft
$\underset{\text{seconds}}{\wedge}$   at