Show sufficient work for all problems. Circle your final answers. Manage your time; don't spend too long on any one problem.

1) Given the function: $f(x)=\dfrac{x+3}{2x-1}$ Find the following.

a) $f\left(-\dfrac{3}{2}\right)=$

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

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

$$=\frac{\frac{3}{2}}{-4}=\frac{3}{2}\div-\frac{4}{1}$$

$$=\frac{3}{2}\cdot-\frac{1}{4}=-\frac{3}{8}$$

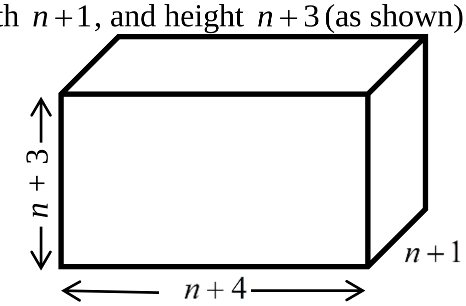
b)
$$f(x+3)=\frac{x+3+3}{2(x+3)-1}$$

$$=\frac{x+6}{2x+6-1}$$

$$=\frac{x+6}{2x+5}$$

2) A closed rectangular box has length $n+4$, width $n+1$, and height $n+3$ (as shown).

a) Write a polynomial function $A(n)$ to represent the area of the base of the box.



$A(n)=(n+4)(n+1)=n^2+5n+5$

b) Write a polynomial function $V(n)$ to represent the volume of the box.

$V(n)=$

$$Lwh=(n+4)(n+1)(n+3)$$

$$=(n^2+5n+5)(n+3)$$

$$=n^2(n+3)+5n(n+3)+5(n+3)$$

$$=n^3+3n^2+5n^2+15n+5n+15$$

$$=n^3+8n^2+20n+15$$

c) Represent the area of the base using a polynomial if both length and width are increased by 3 units.

Area: $A = (n+4+3)(n+1+3)$
$= (n+7)(n+4)$
$= n^2 + 11n + 28$

3) Find each product.

a) $(6-2y^2)(6+2y^2)$
$= 6^2 - (2y^2)^2$
$= 36 - 4y^4$

b) $(3a^3-7)^2$
$= (3a^3)^2 - 2(3a^3)(7) + 7^2$
$= 9a^6 - 42a^3 + 49$

Solve each of the next three equations. Write solutions as rational numbers. If there is more than one solution, separate solutions with commas.

4) Solve: $4(a+2) - 7a = 12 - 3(6-a)$
$4a + 8 - 7a = 12 - 18 + 3a$
$8 - 3a = 3a - 6$
$14 = 6a$
$\frac{14}{6} = \frac{7}{3} = a$

5) Solve: $\frac{7}{5x+7} = \frac{2}{x+5}$

$\frac{7}{5x+7} = \frac{2}{x+5}$ LCD = $(5x+7)(x+5)$ $x \neq -\frac{7}{5}$ or -5

Multiply both sides by the LCD.

$(5x+7)(x+5)\left(\frac{7}{5x+7}\right) = (5x+7)(x+5)\left(\frac{2}{x+5}\right)$
$7(x+5) = 2(5x+7)$
$7x + 35 = 10x + 14$
$21 = 3x$
$7 = x$

6)

$(2n+1)(n+1) = 2(1-n)+6$

$2n^2 + 2n + n + 1 = 2 - 2n + 6$

$2n^2 + 3n + 1 \quad = \quad -2n + 8$

$2n^2 + 5n - 7 = 0$

$(2n+7)(n-1) = 0$

$2n + 7 = 0 \text{ or } n - 1 = 0$

$n = -\frac{7}{2} \qquad n = 1$

7) The bill for the repair of Jon's furnace was \$321. The cost for parts was \$121. The cost for the service call and the first ***half*** hour of labor was \$60. Each additional ***hour*** of labor was \$40 per hour. How many total hours of labor (including the first half hour) were charged on the bill?

Let h = total hours of labor

PLAN: cost of parts + cost of first ½ hour of labor + cost of remaining labor = bill

$121 + 60 + 40(h - \frac{1}{2}) = 321$

$181 + 40h - 20 = 321$

$40h + 161 = 321$

$40h = 160$

$h = 4$

4 total hours of labor

8) On the first part of a 163 mile trip, a driver averaged 62 miles per hour. Due to moderate traffic, the driver only averaged 56 miles per hour for the remainder of the trip. The total driving time of the trip was 2 hours 45 minutes. Find the amount of driving time for each part of the trip.

	Distance	Rate	Time
1^{st} part	$62x$	62	x
2^{nd} part	$56\left(\frac{11}{4} - x\right)$	56	$2\frac{3}{4} - x$

PLAN: distance for 1^{st} part + distance for 2^{nd} part = total distance

(continued on next page)

$$62x+56\left(\frac{11}{4}-x\right)=163$$
$$62x+154-56x=163$$
$$6x=9$$
$$x=\frac{9}{6}=\frac{3}{2} \qquad \frac{11}{4}-\frac{3}{2}=\frac{11}{4}-\frac{6}{4}=\frac{5}{4}$$

time for 1st part: $1\frac{1}{2}$ hr., time for 2nd part: $1\frac{1}{4}$ hr.

9) The base of a triangle is one unit less than the height of the triangle. The area of the triangle is 91 square units. Write an equation to find the length of the **base** of the triangle. What is this length?

$h=$ height of triangle, $h-1=$ base

$$A=\frac{1}{2}bh$$
$$91=\frac{1}{2}h(h-1)$$
$$182=h(h-1)$$
$$0=h^2-h-182$$
$$0=(h-14)(h+13)$$
$$h-14=0 \qquad h+13=0$$
$$h=14 \qquad h=-13$$

-13 is not reasonable. Height: 14 units

Base: 13 units

or $b=$ base, $b+1=$ height

$$A=\frac{1}{2}bh$$
$$91=\frac{1}{2}b(b+1)$$
$$182=b(b+1)$$
$$0=b^2+b-182$$
$$0=(b+14)(b-13)$$
$$b+14=0 \qquad b-13=0$$
$$b=-14 \qquad b=13$$

-14 is not reasonable. Base = 13 units

10) Find the equation of a line (in slope-intercept form, $y = mx + b$) that passes through the point $(6, -2)$ and has the slope $-\frac{2}{3}$. Use your equation to graph the line.

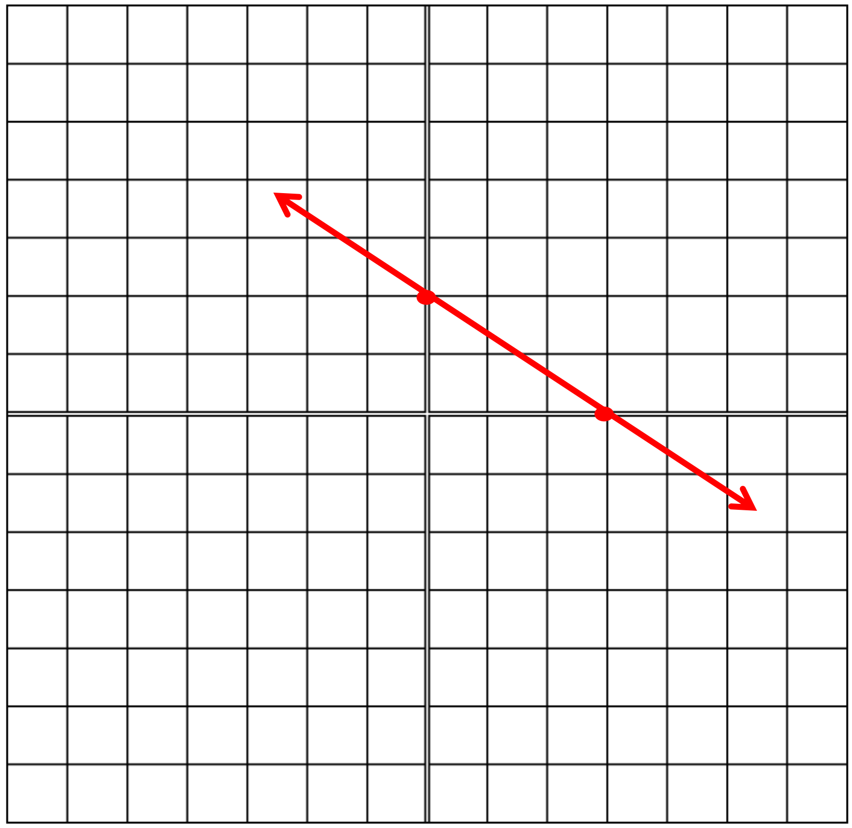
$y - y_1 = m(x - x_1)$

$y - (-2) = -\frac{2}{3}(x - 6)$

$y + 2 = -\frac{2}{3}x + 4$

$y = -\frac{2}{3}x + 2$

y-intercept is 2 and slope is $\frac{-2}{3}$ (move down 2 and 3 right)



11) An entry level job at a certain business had an annual salary of \$30,000 in 2008 and an annual salary of \$36,300 in 2011. Assume the annual salary for this job can be modeled by a linear equation in terms of time in number of years since 2005.

a) Write an equation for the annual salary S in terms of the year. Let $t = 3$ represent 2008.

Point (3, 30000) represents \$30000 in 2008 (year 3 after 2005)
Point (6, 36300) represent \$36300 in 2011

$$m = \frac{36300 - 30000}{6 - 3} = \frac{6300}{3} = 2100$$

$S - S_1 = m(t - t_1)$

$S - 30000 = 2100(t - 3)$

$S - 30000 = 2100t - 6300$

$S = 2100t + 23700$

b) Use your equation from part (a) to find the annual salary for this job in the year 2015.
2015 would be year 10 after 2005.

$S = 2100(10) + 23700$

$S = 21000 + 23700$

$\boxed{S = \$44,700}$

12) $f(x) = x - 5$ $\quad g(x) = x^2 + 2x$

Find $g(f(x))$

$$g(f(x)) = g(x-5)$$
$$= (x-5)^2 + 2(x-5)$$
$$= x^2 - 10x + 25 + 2x - 10$$
$$\boxed{g(f(x)) = x^2 - 8x + 15}$$