

FMPC 10

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#5e

5e) This question wants you to write the equation in the form $y = mx + b$

$$y - \frac{2}{3} = \frac{1}{4}(x - 8)$$

① let's get rid of the fractions by multiplying each side of the equation by the common denominator of 3 and 4 \rightarrow 12

$$12 \left(y - \frac{2}{3} \right) = \left(\frac{1}{4}(x - 8) \right) 12$$

$$12y - 8 = 3(x - 8) \quad \text{because } 12 \times \frac{1}{4} = 3$$

② expand the RIGHT SIDE

$$12y - 8 = 3x - 24$$

③ solve for y

$$12y = 3x - 24 + 8$$

$$12y = 3x - 16$$

④ divide both side by 12

$$\frac{12y}{12} = \frac{3x - 16}{12}$$

$$y = \frac{3x}{12} - \frac{16}{12}$$

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

$$\boxed{y = \frac{1}{4}x - \frac{4}{3}}$$

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#8a, #9a

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8a) $y = x - 2$ is a line with a slope, $m = 1$
and a y-intercept of -2 \rightarrow the coordinate of which
is $(0, -2)$

- ELIMINATE CHOICES i) and iii) because they both have a negative slope

- ii) has neg. y-int. and iii) has a pos. y-int.

\therefore the answer is ii)

9a) ① take the coordinate $(0, 2)$ and slope, $m = 2$ and insert
them into the POINT-SLOPE form of a line.

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

② NOW, solve this equation for y

$$y - 2 = 2x$$

$$y = 2x + 2$$

this is the equation of the line
in slope-intercept form

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#10a

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10a) $4x - 3y = 12$ is the equation of a line in STANDARD FORM

We know that for $Ax + By = C$ slope = $-\frac{A}{B}$

in this case $A=4$, $B=-3$ and $C=12$

$$y\text{-int} = \frac{C}{B}$$

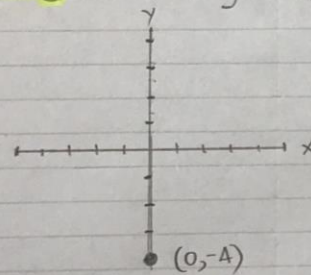
$$\therefore \text{for this equation the slope} = \frac{-4}{-3} = \frac{4}{3}$$

and the $y\text{-int} = \frac{12}{-3} = -4$

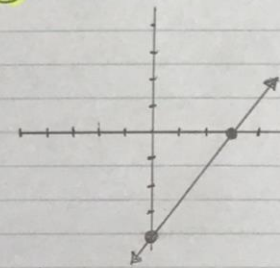
So, we simply want to draw a line with a $y\text{-int}$ @ $(0, -4)$

and a slope, $m = \frac{4}{3}$

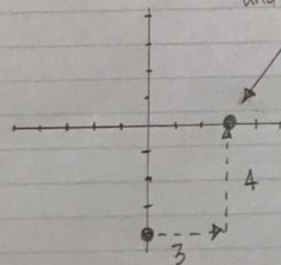
STEP ① PLOT THE $y\text{-int}$ @ $(0, -4)$



STEP ③ CONNECT THE DOTS



STEP ② FROM THE $y\text{-int}$ move 3 units RIGHT and 4 units UP (since the slope is positive) and MARK where you end up



NOTE: Arrows are placed at each end of the line because it continues infinitely in both directions

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#4b

4 b) STEP 1: Find the slope of the line $(1, -4)$ $(1, 6)$
 x_1, y_1 x_2, y_2

$$m = \frac{6 - (-4)}{1 - 1} = \frac{10}{0} = \text{undefined}$$

This is a vertical line which passes through $x=1$

The equation of the line is $x=1$.

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#6a

FMPC 10 5.2 p. 203

6 a) $2x + 5y = 7$ has a slope = $-\frac{2}{5}$

$4x + 10y = 2$ has a slope = $-\frac{4}{10} = -\frac{2}{5}$

We know this because the slope for an equation in

Standard Form $Ax + By = C$ is $m = -\frac{A}{B}$

(this is given in the notes)

Both of these lines have the SAME SLOPE

∴ they are PARALLEL

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#7e

FMPC 10 5.2 p.204

$$7e) \quad \begin{array}{cc} (6, -2) & \text{and} & (-3, 2) \\ x_1 \ y_1 & & x_2 \ y_2 \end{array}$$

① Find the slope first

$$m = \frac{2 - (-2)}{-3 - 6} = \frac{2 + 2}{-9} = \frac{-4}{9}$$

② Pick one of the points and write the equation in POINT-SLOPE FORM.

using $(-3, 2)$ $y - 2 = \frac{-4}{9}(x - (-3))$

$$y - 2 = \frac{-4}{9}(x + 3)$$

$$y - 2 = \frac{-4}{9}x - \frac{12}{9}$$

$$y - 2 = \frac{-4}{9}x - \frac{4}{3}$$

... $\frac{12}{9}$ reduces to $\frac{4}{3}$

$$y = \frac{-4}{9}x - \frac{4}{3} + 2$$

$$y = \frac{-4}{9}x - \frac{4}{3} + \frac{6}{3}$$

express 2 as $\frac{6}{3}$

$$y = \frac{-4}{9}x + \frac{2}{3}$$

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#9

9. Find the x and y intercepts of the line
 $ax + by = ab$.

x -int occur @ $y=0$ $\therefore ax + b(0) = ab$
 $ax = ab$
 $x = b \rightarrow (b, 0)$

y -int occur @ $x=0$ $\therefore a(0) + by = ab$
 $by = ab$
 $y = a \rightarrow (0, a)$

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#2a

FMPC 10 5.3 p.209

$$2a) P(0,0); y = 2x - 5$$

this is the slope

We are looking for the equation of a line with a slope, $m = 2$ passing through $(0,0)$.

USE POINT-SLOPE form to start

$$\therefore y - 0 = 2(x - 0)$$

$$y = 2x$$

$$-2x + y = 0$$

$$\therefore \boxed{2x - y = 0}$$

mult. both sides by -1 because the coefficient of x cannot be negative for equations in Standard Form

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#3k

FMPC 10 5.3 p.210

3 k) The equation of the line given is $\frac{2}{3}x + \frac{3}{4}y = 12$

- We know the slope for the equation of a line in the form

$$Ax + By = C \text{ is } m = -\frac{A}{B}$$

$$\text{in this case, } m = -\frac{\frac{2}{3}}{\frac{3}{4}} = -\frac{2}{3} \times \frac{4}{3} = -\frac{8}{9}$$

- A line perpendicular to this has a slope $m = \frac{9}{8}$

- The equation of a line passing through $(-4, 1)$ with a slope $\frac{9}{8}$ is

$$y - 1 = \frac{9}{8}(x - (-4))$$

$$y - 1 = \frac{9}{8}(x + 4) \quad \text{in POINT-SLOPE form}$$

let's write this equation in STANDARD FORM

$$y - 1 = \frac{9}{8}x + \frac{36}{8} \quad \text{mult. each side by 8}$$

$$(8)y - (8)1 = (8)\frac{9}{8}x + (8)\frac{36}{8}$$

$$8y - 8 = 9x + 36$$

$$-9x + 8y = 36 + 8$$

$$-9x + 8y = 44 \quad \text{mult. each side by } -1$$

$$\boxed{9x - 8y = -44}$$

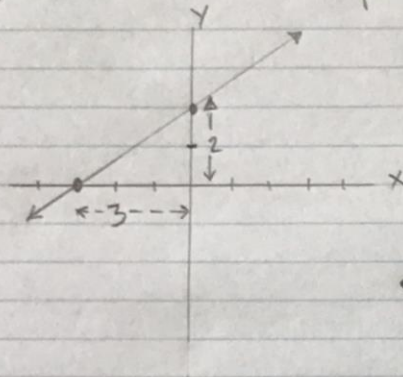
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#4a

FMPC 10 5.3 p.211

4a) Determine the slope of this graph first.



- This graph has a positive slope

$$\text{rise} = 2 \quad \text{run} = 3$$

$$\therefore \text{slope} = \frac{2}{3}$$

- The slope of a line parallel to this line is also $\frac{2}{3}$

- We want to find the equation of a line with a slope $m = \frac{2}{3}$ passing through $(4, -2)$

- Put this into POINT-SLOPE form first.

$$\therefore y - (-2) = \frac{2}{3}(x - 4) \quad \text{now rearrange it into STANDARD FORM}$$

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

$$y + 2 = \frac{2}{3}x - \frac{8}{3} \quad \text{mult. each term by 3}$$

$$3y + 6 = 2x - 8$$

$$-2x + 3y = -8 - 6$$

$$-2x + 3y = -14 \quad \text{mult. both sides by } (-1)$$

$$\boxed{2x - 3y = 14}$$

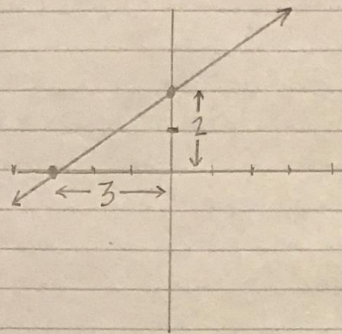
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#5a

FMPC 10 5.3 p.211

5a) Determine the slope of this graph first.



(1) The graph has a positive slope of $\frac{2}{3}$

(2) The slope of the perpendicular line is $-\frac{3}{2}$, the negative reciprocal of $\frac{2}{3}$

(3) We now want to determine the equation of a line with a slope $m = -\frac{3}{2}$ passing through $(4, -2)$

(4) Put this into POINT-SLOPE form first.

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

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

now rearrange it into
STANDARD FORM

$$y + 2 = -\frac{3}{2}x + \frac{12}{2}$$

multiply each term by 2

$$2y + 4 = -3x + 12$$

$$3x + 2y = 12 - 4$$

$$\boxed{3x + 2y = 8}$$

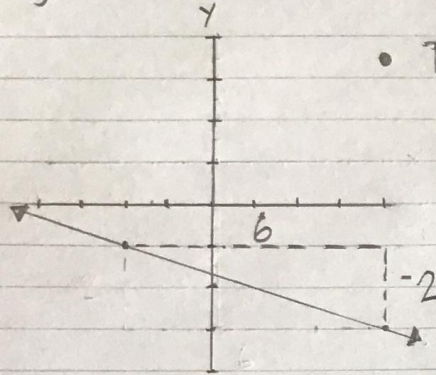
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#5c

FMPC 10 5.3 p. 211

5c) Determine the slope of this graph first.



- The graph has a negative slope and
rise = -2 and run = 6

$$\therefore \text{slope} = \frac{-2}{6} = -\frac{1}{3}$$

- the slope of the perpendicular line is 3 (the negative reciprocal of $-\frac{1}{3}$)

- We now want to find the equation of a line with a slope, $m = 3$ passing through $(2, 1)$
- Put this into POINT-SLOPE form first.

$$\therefore y - 1 = 3(x - 2) \quad \text{now rearrange it into STANDARD FORM}$$

$$y - 1 = 3x - 6$$

$$-3x + y = -6 + 1$$

$$-3x + y = -5$$

mult. both sides by (-1)

$$\boxed{3x - y = 5}$$

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5.3, page 212

#6

FMPC 10 5.3 p.212

6. The slope of $3x + 4y = 8$ is $-\frac{3}{4}$

(we know this because the slope for an equation in the form

$$Ax + By = C \text{ is } m = -\frac{A}{B}$$

$$\text{and } y\text{-int} = \frac{C}{B})$$

The y-intercept of $5x - 3y = 10$ is $\frac{10}{-3}$ $(0, -\frac{10}{3})$

∴ we want to determine the equation of a line with a

slope, $m = -\frac{3}{4}$, passing through $(0, -\frac{10}{3})$

Get this into point-slope form first:

$$y - (-\frac{10}{3}) = -\frac{3}{4}(x - 0)$$

$$y + \frac{10}{3} = -\frac{3}{4}x$$

mult. each term by the c.d. 12

$$12y + 12(\frac{10}{3}) = 12(-\frac{3}{4}x)$$

$$12y + 40 = -9x$$

$$\boxed{9x + 12y = -40}$$

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#6

FMPC 10 5.4, page 215

6. The two points this question gives us are

$$\left(0, \underset{\text{years}}{\$960}\right) \quad \text{and} \quad \left(6, \underset{\text{years}}{\$140}\right)$$

① Determine the slope, $m = \frac{\$140 - \$960}{6 - 0} = \frac{-\$820}{6} = -\$136.67/\text{year}$

this tells us the printer depreciates in value by

$\$136.67$ each year

② Determine an equation by using POINT-SLOPE form

$$y - 960 = -136.67(x - 0)$$

③ Get this into SLOPE-INT. form

$$y - 960 = -136.67x$$

$$y = -136.67x + 960$$

where y represents the value (\$) of the printer after x years

④ To determine the value of the printer after 4 years

$$\text{let } x = 4$$

$$\therefore y = -136.67(4) + 960$$

$$y = -546.68 + 960$$

$$y = \$413.32$$

this is how much the printer is worth after 4 years.

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5.4, page 216

#10

FMPC 10 5.4 p.216

10. The fixed cost is the y-intercept. Let's call it F

The rate of \$3.50 for every 100 copies where x represents the number of copies is expressed as $3.5 \left(\frac{x}{100}\right)$

The equation is $C = \frac{3.5x}{100} + F$

If 800 copies cost \$64 then we know

$$\$64 = \frac{3.5}{100}(800) + F$$

$$\$64 = \$28 + F$$

$$\$64 - \$28 = F$$

$$F = \$36 \quad \text{this is the fixed cost}$$

$$\therefore C = \frac{3.5}{100}x + 36$$

the cost for 1500 copies is

$$C = \frac{3.5}{100}(1500) + 36$$

$$C = 52.50 + 36$$

$$C = \$88.50$$

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5.4, page 216

#11

FMPC 10 5.4 page 216

11. This question gives us two sets of data

$$(62000, 480) \quad (74000, 640)$$

- We can see that as the population increases (independent variable, x) the number of police investigations increase (dependent variable, y)
- The question wants us to create an equation that models this situation and then use the equation to determine the number of police investigations the city will have when the population reaches 100 000

(1) Determine the slope $m = \frac{640 - 480}{74000 - 62000} = \frac{160}{12000} = \frac{16}{1200} = \frac{1}{75}$

this means that for every increase in population of 75 people 1 more police investigation occurs.

(2) Using one of the ordered pairs and the slope, write the equation in point-slope form

$$y - 480 = \frac{1}{75}(x - 62000)$$

(3) Get this into slope-int. form

$$y - 480 = \frac{1}{75}x - 826.67$$

$$y = \frac{1}{75}x - 826.67 + 480$$

$$y = \frac{1}{75}x - 346.67$$

(4) If the population is 100 000

$$\text{then } y = \frac{1}{75}(100000) - 346.67$$

$$y = 986.67 \longrightarrow \boxed{987 \text{ police investigations}}$$

we round up because you can't have a 'partial' investigation

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#13

FMPC. 10 5.4 p. 217

13. The total cost, $C = \text{Selling Price, } P + \text{sales tax } (0.12P) + \20

a) From the question we get

$$C = P + 0.12P + 20$$

[but, $1P + 0.12P$ is equal to $1.12P$]

\therefore

$$C = 1.12P + 20$$

b) If $P = \$1540$

$$\text{then } C = 1.12(1540) + 20 = \boxed{\$1744.80}$$

c) If $C = \$1061.60$

$$\text{then } 1061.60 = 1.12P + 20$$

$$1061.60 - 20 = 1.12P$$

$$1041.60 = 1.12P$$

$$\frac{1041.60}{1.12} = P$$

$$P = \boxed{\$930}$$

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#4a

FMPC 10 5.5 p.220

$$4a) \quad f(x) = -5x + 2 \quad \text{and} \quad f(x) = -3$$

$$\therefore -3 = -5x + 2 \quad \text{because } \underline{\text{both}} \text{ equal } f(x)$$

$$\text{so, } -3 - 2 = -5x$$

$$-5 = -5x$$

$$\longrightarrow \boxed{x=1}$$

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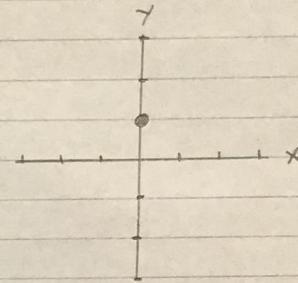
#5a

FMPC 10 5.5 p.221

5a) $f(x) = 2x + 1$ is simply $y = 2x + 1$, which is a line with a slope = 2 and a y-int = 1 (0, 1)

Graph this line by

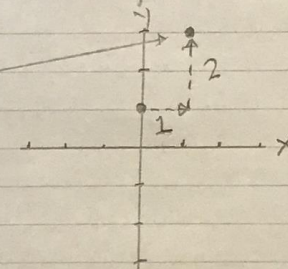
① plotting the y-int.



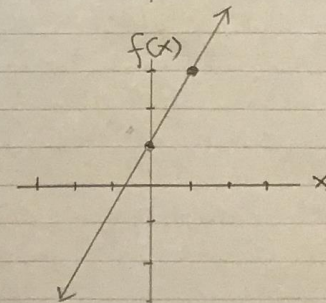
② slope = $\frac{\text{RISE}}{\text{RUN}}$ \therefore slope, 2 = $\frac{2}{1}$

this means that for every 1 unit we move from LEFT to RIGHT from (0, 1), we go UP 2 units

PLOT where we end up.



③ Now, connect the dots.



This is the graph of $f(x) = 2x + 1$

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#7a

FMPC 10 5.5 p. 223

$$7a) \cdot g(r) = 2\pi r$$

$$\therefore g(0.5) = 2\pi(0.5) = \boxed{\pi}$$

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#9a & #9d

FMPC 10 5.5 p.223

$$9a) \quad g(r) = \pi r^2 \quad \therefore \quad g\left(\frac{1}{2}\right) = \pi \left(\frac{1}{2}\right)^2 = \pi \left(\frac{1}{4}\right) = \boxed{\frac{\pi}{4}}$$

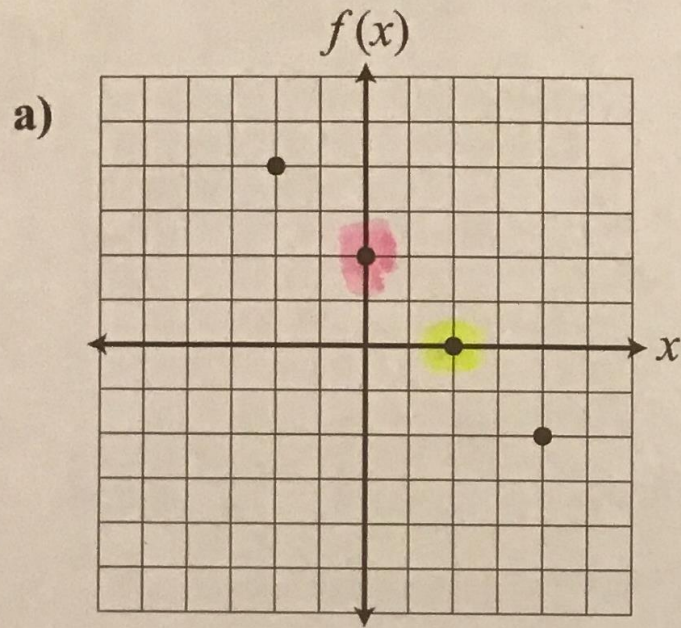
$$\begin{aligned} 9d) \quad g(r) = \pi r^2 \quad \therefore \quad g(h+2) &= \pi (h+2)^2 \\ &= \pi (h+2)(h+2) \\ &= \pi (h^2 + 2h + 2h + 4) \\ &= \pi (h^2 + 4h + 4) \\ &= \boxed{\pi h^2 + 4\pi h + 4\pi} \end{aligned}$$

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#11a

11. Use the graph of each function to state the domain, state the range, determine $f(2)$, and solve $f(x) = 2$ for x .



means, "What is the value of y when $x=2$?"

domain: $\{-2, 0, 2, 4\}$

range: $\{-2, 0, 2, 4\}$

means, "y is equal to 2. What is x ?"

$f(2)$ 0

$f(x) = 2$ 0

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#13c

FMPC 10 5.5 page 226

13c) If the function has $f(2)=5$ and $f(-3)=3$

This means the graph of the line passes through

$(2,5)$ and $(-3,3)$

STEP ① Find the slope of the line: $m = \frac{3-5}{-3-2} = \frac{-2}{-5} = \frac{2}{5}$

STEP ② Using one of the points and the slope, write the equation in POINT-SLOPE form

using $(2,5)$

$$y-5 = \frac{2}{5}(x-2)$$

$$y-5 = \frac{2}{5}x - \frac{4}{5}$$

$$y = \frac{2}{5}x - \frac{4}{5} + 5$$

$$5 = \frac{25}{5} \therefore y = \frac{2}{5}x - \frac{4}{5} + \frac{25}{5}$$

OR

using $(-3,3)$

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

$$y-3 = \frac{2}{5}x + \frac{6}{5}$$

$$y = \frac{2}{5}x + \frac{6}{5} + 3$$

$$3 = \frac{15}{5} \therefore y = \frac{2}{5}x + \frac{6}{5} + \frac{15}{5}$$

$$y = \frac{2}{5}x + \frac{21}{5}$$

$$f(x) = \frac{2}{5}x + \frac{21}{5}$$

FMPC 10 5.5 p.226

14a) If $f(x) = 3x$ then $f(x+h) = 3(x+h)$

$$\begin{aligned}\therefore \frac{f(x+h) - f(x)}{h} &= \frac{3(x+h) - 3x}{h} = \frac{3x + 3h - 3x}{h} \\ &= \frac{3h}{h} = \boxed{3}\end{aligned}$$