

## AP Calculus Summer Packet

This is a short collection of problems that represent skills you need to have before starting my class. In addition, pretty much anything we did last year in Pre-Cal is also expected. This sheet contains mostly things that are older than that. If there is anything in this that you don't know how to do or struggle with you need to let me know first thing next year so we can go over it together.

For 1 - 7, write an equation for each line in *point-slope* form.

1. Containing  $(4,-1)$  with slope of  $\frac{1}{2}$ .
2. Crossing the x-axis at  $x = -3$  and the y-axis at  $y = 6$ .
3. Containing the points  $(-6, -1)$  and  $(3, 2)$ .
4. Passing through  $(5, -3)$  with an undefined slope.
5. Passing through  $(-4, 2)$  with a zero slope.
6. Passing through  $(2, 8)$  and parallel to  $y = \frac{5}{6}x - 1$
7. Passes through  $(6, -7)$  that is perpendicular to  $y = -2x - 5$ .

For 8-15, solve each equation for  $x$ . Sometimes you will get a numeric answer but usually you will get other variables in your answer. For example:  $x = \frac{a+b}{c}$  is an acceptable answer.

8.  $x^2 + 3x = 8x - 6$

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

10.  $3xy + 6 = 12 + xz$

11.  $cx = vx$

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

13.  $x^2 - 6x + 9 = 0$

14.  $4x^2 + 4x + 1 = 0$

15.  $\frac{\sqrt{\frac{1}{4} + x^2}}{2} = \frac{2-x}{3}$

For 16 - 19, let  $f(x) = 5 - \frac{2x}{3}$  and  $g(x) = \frac{1}{2}x^2 + 3x$

16. Evaluate  $f\left(\frac{1}{2}\right) + g(-2)$

17. Write an expression for  $g(x+h)$ . *Do not simplify.*

18. Write an expression for  $\frac{g(x+h) - g(x)}{h}$ . And then simplify it, and then plug 0 in for  $h$ .

19.  $g(f(x^3))$  Do not simplify.

20. Graph the piece wise function:  $f(x) = \begin{cases} x+3 & \text{if } x < 1 \\ -2x+5 & \text{if } x \geq 1 \end{cases}$

$$1. y - y_1 = m(x - x_1)$$

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

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

$$2. (-3, 0) \quad (0, 6)$$

$$m = \frac{6 - 0}{0 - (-3)} = 2$$

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

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$$3. m = \frac{2 + 1}{3 + 6} = \frac{3}{9} = \frac{1}{3}$$

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

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

4. Undefined Slope  $\Rightarrow$  vertical line

$$x = 5$$

$$x - 5 = 0$$

$$5. m = 0$$

$$y - 2 = 0(x + 4)$$

$$y - 2 = 0$$

$$y = 2$$

$$6. m = \frac{5}{6}$$

$$y - 8 = \frac{5}{6}(x - 2)$$

$$7. m = \frac{1}{2}$$

$$y + 7 = \frac{1}{2}(x - 6)$$

$$8. x^2 + 3x = 8x - 6$$

$$x^2 + 3x - 8x + 6 = 0$$

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

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

$$x = \{3, 2\}$$

$$9. \frac{2x - 5}{x + y} = 3 - y$$

$$2x - 5 = (3 - y)(x + y)$$

$$2x - 5 = 3x + 3y - xy - y^2$$

$$2x - 3x + xy = 5 + 3y - y^2$$

$$x(2 - 3 + y) = 5 + 3y - y^2$$

$$x = \frac{5 + 3y - y^2}{y - 1}$$

$$10. 3xy + 6 = 12 + xz$$

$$3xy - xz = 6$$

$$x(3y - z) = 6$$

$$x = \frac{6}{3y - z}$$

$$11. cx = vx$$

$$(x - vx) = 0$$

$$(c - v)x = 0$$

so, either  $x = 0$  or  $c - v = 0$

in which case

$x$  can equal anything

$$12. \frac{3+x}{5-x} = 6+y$$

$$3+x = (6+y)(5-x)$$

$$3+x = 30 - 6x + 5y - xy$$

$$x+xy+6x = 27+5y$$

$$x(1+y+6) = 27+5y$$

$$x = \frac{27+5y}{y+7}$$

$$13. (x-3)^2 = 0$$

$$x-3=0$$

$$x=3$$

$$14. 4x^2+4x+1=0$$

$$A=4 \quad B=4 \quad C=1$$

$$x = \frac{-4 \pm \sqrt{16-16}}{8}$$

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

$$15. \frac{\sqrt{\frac{1}{4}+x^2}}{2} = \frac{2-x}{3}$$

$$\sqrt{\frac{1}{4}+x^2} = \frac{4-2x}{3}$$

$$\frac{1}{4}+x^2 = \frac{(4-2x)^2}{9}$$

$$\frac{1}{4}+x^2 = \frac{16-16x+4x^2}{9}$$

$$\frac{9}{4}+9x^2 = 4x^2-16x+16$$

$$5x^2+16x-\frac{55}{4}=0$$

$$20x^2+64x-55=0$$

$$16. f\left(\frac{1}{2}\right) + 9(-2)$$

$$5 - \frac{2\left(\frac{1}{2}\right)}{3} + \frac{1}{2}(-2)^2 + 3(-2)$$

$$5 - \frac{1}{3} + 2 - 6$$

$$\frac{2}{3}$$

$$17. \frac{1}{2}(x+h)^2 + 3(x+h)$$

$$18. \frac{\frac{1}{2}(x+h)^2 + 3(x+h) - \left(\frac{1}{2}x^2 + 3x\right)}{h}$$

$$\frac{\frac{1}{2}x^2 + xh + \frac{1}{2}h^2 + 3x + 3h - \frac{1}{2}x^2 - 3x}{h}$$

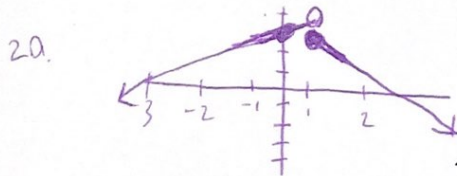
$$\frac{xh + \frac{1}{2}h^2 + 3h}{h}$$

$$x + \frac{1}{2}h + 3$$

$$x + 3 \checkmark$$

$$19. 9\left(5 - \frac{2x^3}{3}\right)$$

$$\frac{1}{2}\left(5 - \frac{2x^3}{3}\right)^2 + 3\left(5 - \frac{2x^3}{3}\right)$$



$$x = \frac{-64 \pm \sqrt{4096 + 4400}}{40}$$

$$A=20$$

$$B=64$$

$$C=-55$$