

**Cherry Creek High School
Summer Assignment for students entering:
AP Calculus AB**

Please have the following worksheets completed and ready to be handed in on the first day of class, August 16, 2023. Make sure you show your work where appropriate. Answers are provided for you to check; however, you will not be given credit if you don't show work on problems that require it. It is expected that you have a good understanding of this material coming in to these courses as teachers will not be doing an extensive review of previously learned material.

Have a great summer and we look forward to seeing you in the fall!

The CCHS Math Department

AP Calculus AB
Worksheet 0.1
Algebra Review - No Calculator

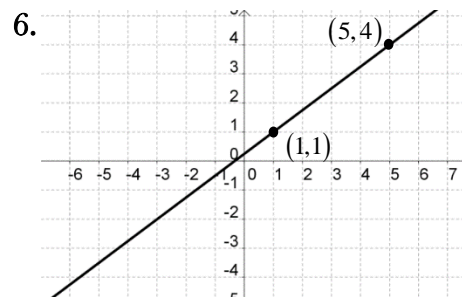
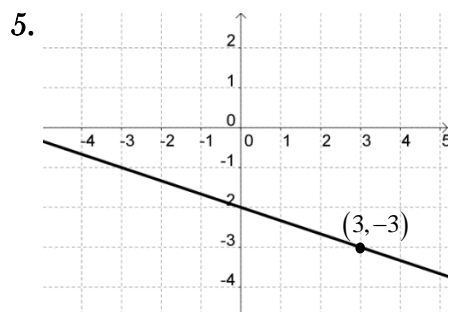
Find the equation of the line in point-slope form using the given information.

1. $m = -2$, goes through $(-1, 4)$

2. goes through $(1, 4)$ & $(3, 10)$

3. goes through $(-4, -5)$ & $(-1, -1)$

4. goes through $(3, 7)$ & $(3, 9)$



Evaluate the following based on the functions given below.

$f(x) = 2x + 3$ $g(x) = 3x^2 - x$ $j(x) = |x - 5|$

7. $f(3)$

8. $g(j(2))$

9. $f(x+h)$

10. $g(x+h)$

11. Write $j(x)$ as a piecewise function.

AP Calculus AB
Worksheet 0.2
Factoring & Division Review - No Calculator

Factor completely using a variety of methods.

1. $15x^2 + 6x$

2. $x^2 + 14x - 32$

3. $5x^3y^{-2} + 35x^2y^{-5}$

4. $x^2 - 16$

5. $64x^2 - 25y^2$

6. $x^2 + 36$

7. $x^3 + 64$

8. $8x^3 - 27$

9. $125x^3 + 1$

10. $x^3 + 3x^2 + 2x + 6$

11. $x^3 + x^2 - 16x - 16$

12. $2x^2 - 11x - 21$

13. $x^2y + 6xy + 5y$

14. $4x^5 - 64x^3$

15. $x^4 - 7x^2 - 18$

16. $(x+2)^3(x-1) + (x+2)^2(x-1)^2$

17. $3x^2(x-4)^3 + 9x(x-4)^2$

18. $x^2(x-3)^{-2} - 2x(x-3)^{-1}$

Divide the polynomials using synthetic or long division.

19. $\frac{x^3 - 2x^2 + x + 3}{x - 1}$

20. $\frac{2x^4 + 3x}{x + 4}$

21. $\frac{x^4 - 3x^3 + x}{x^2 - 1}$

AP Calculus AB
Worksheet 0.3
Solving Review - No Calculator

Solve for all real values of x . Show all work.

1. $x^2 - 10x + 24 = 0$

2. $x^2 - 40 = 18x$

3. $125 - x^3 = 0$

4. $x^2 - 144 = 0$

5. $x^3 + 13x^2 - 48x = 0$

6. $x^2 + 14x + 49 = 0$

7. $3x^2 + 4x - 5 = 0$

8. $18x^2 - 15x - 18 = 0$

9. $\frac{2}{3}x - \frac{1}{4} = 5$

Make a sign chart to solve the inequalities. Give answers in interval notation.

10. $x^2 + 9x - 22 < 0$

11. $x^2 - 16 \geq 0$

12. $x(x-3)^2(x+2) \leq 0$

13. $\frac{x-1}{x+4} \leq 0$

14. $\frac{x^2}{(x-1)} \geq 0$

15. $\frac{x^2 - 4x + 3}{x^2 + 4x - 21} > 0$

AP Calculus AB
Worksheet 0.4
Trigonometry Review - No Calculator

Give the exact value of each.

1. $\cot\left(\frac{5\pi}{6}\right)$

2. $\csc\left(\frac{5\pi}{4}\right)$

3. $\cos\left(\frac{\pi}{4}\right)$

4. $\csc(\pi)$

5. $\csc\left(\frac{3\pi}{2}\right)$

6. $\tan\left(\frac{2\pi}{3}\right)$

7. $\sin\left(\frac{5\pi}{6}\right)$

8. $\cos\left(\frac{4\pi}{3}\right)$

9. $\sec\left(\frac{5\pi}{3}\right)$

10. $\tan\left(\frac{7\pi}{6}\right)$

11. $\cot\left(\frac{\pi}{2}\right)$

12. $\sec\left(\frac{11\pi}{6}\right)$

Solve for all x in $0 \leq x < 2\pi$.

13. $\cos x = \frac{\sqrt{3}}{2}$

14. $\cot x = 1$

15. $\sec x = -1$

16. $\sin x = -\frac{1}{2}$

17. $\tan x = -\frac{1}{\sqrt{3}}$

18. $\sin x = -\frac{\sqrt{3}}{2}$

19. $\csc x = \frac{2}{\sqrt{3}}$

20. $\sin x = 0$

21. $\tan x = \sqrt{3}$

Simplify the inverse trig expressions. (Hint: Angles in Quadrant IV should be negative!)

22. $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

23. $\arccos\left(\frac{1}{\sqrt{2}}\right)$

24. $\tan^{-1}(-1)$

25. $\text{arc cot}(-\sqrt{3})$

26. $\cos^{-1}\left(-\frac{1}{2}\right)$

27. $\text{arc sec}(1)$

Double Angle Identities:

$$\sin(2x) = 2 \sin x \cos x$$

$$\cos(2x) = \cos^2 x - \sin^2 x$$

Solve for all x in $0 \leq x < 2\pi$.

28. $\sin^2 x - \sin x = 0$

29. $2 \sin^2 x + 3 \sin x + 1 = 0$

30. $2 \cos^2 x + \cos x = 0$

31. $\sin 2x - \cos x = 0$

32. $\cos 2x + \sin^2 x = 1$

33. $\tan^2 x \sin x = \sin x$

AP Calculus AB
Worksheet 0.5
Limits & Derivatives Review – No Calculator

Evaluate the following limits. Use appropriate notation as discussed in Pre-calculus.

1. $\lim_{x \rightarrow 2} 7x^2 - 1$
2. $\lim_{x \rightarrow 2} \frac{x^2 - x - 2}{x - 2}$
3. $\lim_{x \rightarrow 3} \frac{3 - x}{x^2 - 9}$
4. $\lim_{x \rightarrow 5} \frac{\sqrt{5} - \sqrt{x}}{5 - x}$
5. $\lim_{x \rightarrow 0} \frac{x^2 - 4}{x - 2}$
6. $\lim_{x \rightarrow \infty} 6x^3 + 2x^2 - 4x + 1$
7. $\lim_{x \rightarrow \pi} \cos(2x)$
8. $\lim_{x \rightarrow -\infty} \frac{x - 4}{x^2 - 2}$
9. $\lim_{x \rightarrow 1} \frac{3}{x - 1}$

Use the given piecewise functions.

10. $f(x) = \begin{cases} 2x, & x < -4 \\ 3, & x = -4 \\ x - 4, & x > -4 \end{cases}$
 - a) $\lim_{x \rightarrow -4^-} f(x)$
 - b) $\lim_{x \rightarrow -4^+} f(x)$
 - c) $\lim_{x \rightarrow -4} f(x)$
 - d) $f(-4)$
11. $g(x) = \begin{cases} x^2, & x \geq 5 \\ \sqrt{x - 4}, & x < 5 \end{cases}$
 - a) $\lim_{x \rightarrow 5^-} g(x)$
 - b) $\lim_{x \rightarrow 5^+} g(x)$
 - c) $\lim_{x \rightarrow 5} g(x)$
 - d) $g(5)$
12. $h(x) = \begin{cases} 4, & x < 3 \\ |x + 1|, & x \geq 3 \end{cases}$
 - a) $\lim_{x \rightarrow 3^-} h(x)$
 - b) $\lim_{x \rightarrow 3^+} h(x)$
 - c) $\lim_{x \rightarrow 3} h(x)$
 - d) $h(3)$

For #13-24, find $f'(x)$. Label equations ($f(x)$ or $f'(x)$) and factor when possible.

13. $f(x) = 2x^4 - 5x + 3$

14. $f(x) = \frac{1}{x} + \sqrt{x}$

15. $f(x) = \sin(10x)$

16. $f(x) = \frac{3x^2 + x + \sqrt{x}}{x}$

17. $f(x) = 4x(x+3)^5$

18. $f(x) = \frac{\cos x}{x}$

19. $f(x) = 2 \sin x \cos x$

20. $f(x) = 3(2x+5)^{10}$

21. $f(x) = \sqrt{2x+1}$

22. $f(x) = \frac{10}{(x+5)^2}$

23. $f(x) = x \cdot \tan(2x)$

24. $f(x) = \csc(x^2)$

25. Write the equation (in point-slope form) of the line tangent to $f(x) = x^2 - 3x$ at $x = 1$.

26. A particle's position is given by $s(t) = \frac{1}{3}t^3 + 4t^2 - 2t + 1$.

a) Find the particle's velocity and acceleration when $t = 2$.

b) Is the particle speeding up or slowing down when $t = 2$? Justify your answer.

AP Calculus AB
Chapter 0 Answers

- Worksheet 0.1 Answers:**
- | | |
|---|--|
| 1. $y - 4 = -2(x + 1)$ | 2. $y - 4 = 3(x - 1)$ or $y - 10 = 3(x - 3)$ |
| 3. $y + 5 = \frac{4}{3}(x + 4)$ or $y + 1 = \frac{4}{3}(x + 1)$ | 4. $x = 3$ |
| 5. $y + 3 = -\frac{1}{3}(x - 3)$ | |
| 6. $y - 1 = \frac{3}{4}(x - 1)$ or $y - 4 = \frac{3}{4}(x - 5)$ | 7. 9 |
| 8. 24 | 9. $2x + 2h + 3$ |
| 10. $3x^2 + 3h^2 + 6xh - x - h$ | 11. $\begin{cases} x - 5, & x \geq 5 \\ -x + 5, & x < 5 \end{cases}$ |

- Worksheet 0.2 Answers:**
- | | | |
|---|---------------------------------|---|
| 1. $3x(5x + 2)$ | 2. $(x + 16)(x - 2)$ | 3. $5x^2y^{-5}(xy^3 + 7)$ |
| 4. $(x + 4)(x - 4)$ | 5. $(8x + 5y)(8x - 5y)$ | 6. prime |
| 7. $(x + 4)(x^2 - 4x + 16)$ | | |
| 8. $(2x - 3)(4x^2 + 6x + 9)$ | 9. $(5x + 1)(25x^2 - 5x + 1)$ | 10. $(x^2 + 2)(x + 3)$ |
| 11. $(x + 4)(x - 4)(x + 1)$ | 12. $(2x + 3)(x - 7)$ | 13. $y(x + 5)(x + 1)$ |
| 14. $4x^3(x + 4)(x - 4)$ | | |
| 15. $(x + 3)(x - 3)(x^2 + 2)$ | 16. $(x + 2)^2(x - 1)(2x + 1)$ | 17. $3x(x - 4)^2(x - 1)(x - 3)$ |
| 18. $-x(x - 3)^{-2}(x - 6)$ | 19. $x^2 - x + \frac{3}{x - 1}$ | 20. $2x^3 - 8x^2 + 32x - 125 + \frac{500}{x + 4}$ |
| 21. $x^2 - 3x + 1 - \frac{2x - 1}{x^2 - 1}$ | | |

- Worksheet 0.3 Answers:**
- | | | |
|--|-----------------------|------------------------------|
| 1. $x = 4, 6$ | 2. $x = -2, 20$ | 3. $x = 5$ |
| 4. $x = -12, 12$ | 5. $x = -16, 0, 3$ | 6. $x = -7$ |
| 7. $x = \frac{-2 \pm \sqrt{19}}{3}$ | | |
| 8. $x = -\frac{2}{3}, \frac{3}{2}$ | 9. $x = \frac{63}{8}$ | 10. $(-11, 2)$ |
| 11. $(-\infty, -4] \cup [4, \infty)$ | | |
| 12. $[-2, 0] \cup \{3\}$ | 13. $(-4, 1]$ | 14. $\{0\} \cup (1, \infty)$ |
| 15. $(-\infty, -7) \cup (1, 3) \cup (3, \infty)$ | | |

- Worksheet 0.4 Answers:**
- | | | | | |
|---|--|-------------------------|---|---|
| 1. $-\sqrt{3}$ | 2. $-\sqrt{2}$ | 3. $\frac{1}{\sqrt{2}}$ | 4. \emptyset | 5. -1 |
| 6. $-\sqrt{3}$ | 7. $\frac{1}{2}$ | 8. $-\frac{1}{2}$ | 9. 2 | 10. $\frac{1}{\sqrt{3}}$ |
| 11. 0 | 12. $\frac{2}{\sqrt{3}}$ | | | |
| 13. $x = \frac{\pi}{6}, \frac{11\pi}{6}$ | 14. $x = \frac{\pi}{4}, \frac{5\pi}{4}$ | 15. $x = \pi$ | 16. $x = \frac{7\pi}{6}, \frac{11\pi}{6}$ | 17. $x = \frac{5\pi}{6}, \frac{11\pi}{6}$ |
| 18. $x = \frac{4\pi}{3}, \frac{5\pi}{3}$ | 19. $x = \frac{\pi}{3}, \frac{2\pi}{3}$ | 20. $x = 0, \pi$ | 21. $x = \frac{\pi}{3}, \frac{4\pi}{3}$ | 22. $\frac{\pi}{3}$ |
| 23. $\frac{\pi}{4}$ | | | | |
| 24. $-\frac{\pi}{4}$ | 25. $\frac{5\pi}{6}$ | 26. $\frac{2\pi}{3}$ | 27. 0 | 28. $x = 0, \frac{\pi}{2}, \pi$ |
| 29. $x = \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$ | | | | |
| 30. $x = \frac{\pi}{2}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{3\pi}{2}$ | 31. $x = \frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{3\pi}{2}$ | 32. $x = 0, \pi$ | 33. $x = 0, \frac{\pi}{4}, \frac{3\pi}{4}, \pi, \frac{5\pi}{4}, \frac{7\pi}{4}$ | |

- Worksheet 0.5 Answers:**
1. 27 2. 3 3. $-\frac{1}{6}$ 4. $\frac{1}{2\sqrt{5}}$ 5. 2
6. ∞ 7. 1 8. 0 9. dne 10. a) -8, b) -8, c) -8, d) 3
11. a) 1, b) 25, c) dne, d) 25 12. a) 4, b) 4, c) 4, d) 4
13. $f'(x) = 8x^3 - 5$ 14. $f'(x) = -\frac{1}{x^2} + \frac{1}{2\sqrt{x}}$ 15. $f'(x) = 10\cos(10x)$
16. $f'(x) = 3 - \frac{1}{2\sqrt{x^3}}$ 17. $f'(x) = 12(x+3)^4(2x+1)$ 18. $f'(x) = -\frac{x \sin x + \cos x}{x^2}$
19. $f'(x) = 2\cos(2x)$ 20. $f'(x) = 60(2x+5)^9$ 21. $f'(x) = \frac{1}{\sqrt{2x+1}}$
22. $f'(x) = \frac{-20}{(x+5)^3}$ 23. $f'(x) = \tan(2x) + 2x \sec^2(2x)$ 24. $f'(x) = -2x \csc(x^2) \cot(x^2)$
25. $y+2 = -(x-1)$ 26. a) $v(2) = 18, a(2) = 12$, b) speeding up because $v(2)$ and $a(2)$ have the same sign
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