

**SJU Calculus and AP Calculus
Summer Assignment 2019**

The following packet contains material that has been presented in your prior math classes that pertain to your upcoming calculus course. It is important that you are proficient in all the concepts covered in this packet or you will have a difficult time in keeping up with this class. **It is your responsibility to know the material.** If there is a topic you are not familiar with, you should find someone who can help you or search for resources as part of your summer preparation.

Only place your final answers in the packet and provide additional sheets of loose leaf containing ALL your work. You should have the answers and the work pages ready to turn in September 9 (the first Monday after school starts).

Please remember:

- Show all work on separate sheets
- Be very neat!
- Complete all the problems in the packet – nothing is to be omitted
 - Don't simplify unless instructed
 - Don't rationalize
- Either staple or paperclip all the pages together

I'm looking forward to a fun, intense-filled year of calculus!
Ms. Muoio

Algebraic Errors to Avoid

Error	Correction	Comments
$(a + b)^2 \neq a^2 + b^2$	$(a + b)^2 = a^2 + 2ab + b^2$	Always expand before multiplying
$\sqrt{a^2 + b^2} \neq a + b$	Leave as $\sqrt{a^2 + b^2}$	Cannot split up a radical to separate terms
$\frac{x}{a + b} \neq \frac{x}{a} + \frac{x}{b}$	Leave as $\frac{x}{a + b}$	Cannot split up denominators
$x^{-2} + x^{-3} \neq \frac{1}{x^2 + x^3}$	$x^{-2} + x^{-3} = \frac{1}{x^2} + \frac{1}{x^3}$	Separate fractions (x^{-2} doesn't effect the x^{-3})
$\frac{1}{3x} \neq \frac{1}{3}x$	Leave as $\frac{1}{3x}$ or change to $\frac{1}{3} \cdot \frac{1}{x}$	Be clear where your variable is supposed to be
$\frac{a + bx}{a} \neq 1 + bx$	$\frac{a + bx}{a} = 1 + \frac{b}{a}x$	Divide each fraction by the denominator
$\frac{a + ax}{a} \neq a + x$	$\frac{a + ax}{a} = 1 + x$	Divide each fraction by the denominator (factor before simplifying)

Simplifying Complex Fractions

1. $\frac{\frac{25}{x} - x}{5 + x}$

2. $\frac{4 - \frac{12}{2x-3}}{5 + \frac{15}{2x-3}}$

3. $\frac{\frac{x}{x+1} + \frac{1}{x}}{\frac{x}{x+1} - \frac{1}{x}}$

Functions

4. Let $f(x) = 2x + 1$ and $g(x) = 2x^2 - 1$. Find:

a) $f(2)$

b) $g(-3)$

c) $f(r + 1)$

d) $f(g(-2))$

e) $g(f(m + 4))$

5. Let $f(x) = \sin(x)$. Find:

a) $f\left(\frac{\pi}{2}\right)$

b) $f\left(\frac{2\pi}{3}\right)$

6. Find $\frac{f(x+h) - f(x)}{h}$ for the given function f.

a) $f(x) = 9x + 3$

b) $f(x) = 5 - 2x$

7. Solve the system of equations:

a) $y = 3x - 30$
 $x^2 + y^2 = 100$

b) $x^2 = 2y + 10$
 $3x - y = 9$

8. Find the inverse for each function.

a) $f(x) = 2x + 1$

b) $g(x) = \frac{x^2}{3} - 8$

9. Find the domain and range of each function. Write your answer both in interval notation and as an inequality.

a) $f(x) = x^2 - 5$

b) $f(x) = -\sqrt{x+3}$

c) $f(x) = 3 \sin(x)$

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

10. Describe the transformations from the parent function:

a) $f(x) = x^2 - 1$

b) $g(x) = 2|x+1|$

c) $h(x) = \sqrt{x-5} - 2$

d) $f(x) = -(x-3)^2 + 1$

e) $g(x) = \frac{1}{3}(x+5)^3 + 3$

Logarithms

$$1. \log_b(mn) = \log_b(m) + \log_b(n)$$

$$2. \log_b\left(\frac{m}{n}\right) = \log_b(m) - \log_b(n)$$

$$3. \log_b(m^n) = n \log_b(m)$$

11. Expand each logarithm:

a) $\log x^2 y^3 z$

b) $\log_2 \frac{xy^2}{z^3}$

12. Condense each logarithm:

a) $\log 2x + 3(\log y - \log z)$

b) $\frac{1}{2} \log x - 4 \log y + \log z$

13. Solve each log equation and check all answers (each expression must be positive).

a) $\log(x) + \log(x+9) = 1$

b) $\log_5 \sqrt{x^2+1} = 1$

c) $\log x^2 - \log(x-1) = 1$

Lines

Slope-Intercept Form: $y = mx + b$	Point-Slope Form: $y - y_1 = m(x - x_1)$
------------------------------------	--

14. Determine the equation of a line having a slope of 3 and y-intercept of 5.

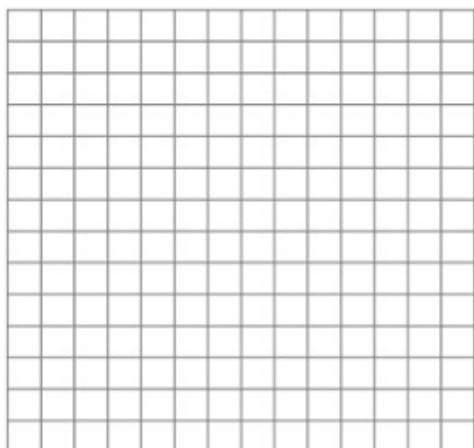
15. Determine the equation of a line passing through the point (0,5) with a slope of 2/3.

16. Determine the equation of a line passing through the point (2,8) and parallel to $y = \frac{5}{6}x - 1$.

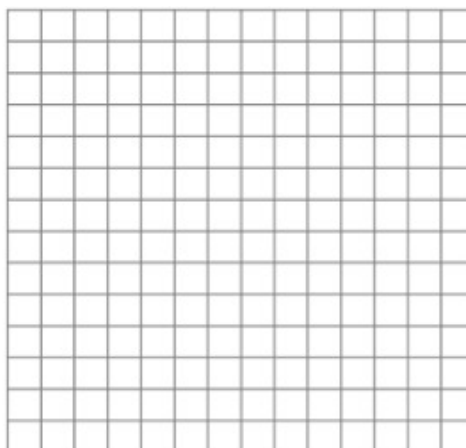
17. Determine the equation of a line perpendicular to the y-axis passing through the point (4,7).

18. Determine the equation of a line passing through the points (-3,6) and (1,2).

19. Graph the circle: $x^2 + y^2 = 16$



20. Graph the ellipse: $\frac{x^2}{16} + \frac{y^2}{4} = 1$



Trigonometry

Reciprocal Identities:

$$\csc(x) = \frac{1}{\sin(x)} \quad \sec(x) = \frac{1}{\cos(x)} \quad \cot(x) = \frac{1}{\tan(x)}$$

Quotient Identities:

$$\tan(x) = \frac{\sin(x)}{\cos(x)} \quad \cot(x) = \frac{\cos(x)}{\sin(x)}$$

21. Convert from radians to degrees:

a) $\frac{5\pi}{6}$

b) $\frac{4\pi}{5}$

c) 2.63

22. Convert from degrees to radians:

a) 45°

b) -17°

c) 230°

23. Sketch each angle in standard position and draw the reference triangle:

a) $\frac{2\pi}{3}$

b) 225°

c) $-\frac{\pi}{4}$

d) 30°

24. Find the exact value of:

a) $\sin(180^\circ)$

b) $\cos(270^\circ)$

c) $\sin(-90^\circ)$

d) $\sin(\pi)$

e) $\cos(2\pi)$

f) $\cos(-\pi)$

25. Graph two periods of:

a) $f(x) = 5 \sin(x)$

b) $f(x) = \sin(2x)$

c) $f(x) = -\cos(x) - 2$

d) $f(x) = 3\cos(x) + 4$

26. Solve each equation for all values of x where $0 \leq x \leq 2\pi$.

a) $\sin(x) = \frac{1}{2}$

b) $2 \cos(x) = -\sqrt{3}$

c) $\sin^2(x) = \frac{1}{2}$

d) $4 \cos^2(x) - 3 = 0$

27. Express the value of y in radians.

a) $y = \arcsin\left(-\frac{\sqrt{3}}{2}\right)$

b) $y = \arccos(-1)$

c) $y = \arctan(-1)$

28. Give the value of each (by drawing a triangle and using SOHCAHTOA):

a) $\tan(\arccos(\frac{2}{3}))$

b) $\sec(\arcsin(\frac{12}{13}))$

c) $\sin(\arctan(\frac{12}{5}))$

Limits

29. Complete the table to find the limit as x approaches 4.

$$\lim_{x \rightarrow 4} \frac{x-4}{x^2-3x-4}$$

x	3.9	3.99	3.999	4.001	4.01	4.1
f(x)						

30. Find each limit graphically:

a) $\lim_{x \rightarrow 0} \cos(x)$

b) $\lim_{x \rightarrow 5^-} \frac{2}{x-5}$

c) $\lim_{x \rightarrow 5^+} \frac{2}{x-5}$

31. Find each limit by direct substitution:

a) $\lim_{x \rightarrow 2} (4x^2 + 3)$

b) $\lim_{x \rightarrow 0} \sqrt{x^3 + 4}$

c) $\lim_{x \rightarrow 1} \frac{x^2 + x + 2}{x + 1}$

32. Find each limit (either factor/simplify or rationalize/simplify):

a) $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1}$

b) $\lim_{x \rightarrow 3} \frac{3 - x}{x^2 - 9}$

c) $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$

33. Find the vertical asymptotes of:

a) $f(x) = \frac{1}{x^2}$

b) $f(x) = \frac{x^2}{x^2 - 4}$

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

34. Find the horizontal asymptotes of:

a) $f(x) = \frac{x^2 - 2x + 1}{x^3 + x - 7}$

b) $f(x) = \frac{5x^3 - 2x^2 + 8}{4x - 3x^3 + 5}$

c) $f(x) = \frac{4x^5}{x^2 - 7}$