

Summer Assignment AP Calc AB

On a separate sheet of paper, follow the directions for each problem. It is imperative that you show your work clearly and neatly.

1. Evaluate each expression without using a calculator.

a. $(-3)^4$ b. -3^4 c. 3^{-4} d. $\frac{5^{23}}{5^{21}}$ e. $\left(\frac{2}{3}\right)^{-2}$ f. $16^{\frac{3}{4}}$

2. Simplify each expression. Write your answer without negative exponents.

a. $\sqrt{200} - \sqrt{32}$ b. $(3a^3b^3)(4ab^2)^2$ c. $\left(\frac{3x^{\frac{3}{2}}y^3}{x^2y^{\frac{1}{2}}}\right)^{-2}$

3. Expand and simplify.

a. $3(x+6)+4(2x-5)$ b. $(x+3)(4x-5)$ c. $(\sqrt{a}+\sqrt{b})(\sqrt{a}-\sqrt{b})$
d. $(2x+3)^2$ e. $(x+2)^3$

4. Factor each expression.

a. $4x^2 - 25$ b. $2x^2 + 5x - 12$ c. $x^3 - 3x^2 - 4x + 12$ d. $x^4 + 27x$
e. $3x^{\frac{3}{2}} - 9x^{\frac{1}{2}} + 6x^{-\frac{1}{2}}$ f. $x^3y - 4xy$

5. Simplify the rational expression.

a. $\frac{x^2 + 3x + 2}{x^2 - x - 2}$ b. $\frac{2x^2 - x - 1}{x^2 - 9} \cdot \frac{x + 3}{2x + 1}$

c. $\frac{x^2}{x^2 - 4} - \frac{x + 1}{x + 2}$ d. $\frac{\frac{y}{x} - x}{\frac{1}{y} - \frac{1}{x}}$

6. Rationalize the expression and simplify.

a. $\frac{\sqrt{10}}{\sqrt{5} - 2}$ b. $\frac{\sqrt{4+h} - 2}{h}$

7. Rewrite by completing the square.

a. $x^2 + x + 1$ b. $2x^2 - 12x + 11$

8. Solve the equation. (Find only real solutions.)

a. $x + 5 = 14 - \frac{1}{2}x$ b. $\frac{2x}{x+1} = \frac{2x-1}{x}$ c. $x^2 - x - 12 = 0$
d. $2x^2 + 4x + 1 = 0$ e. $x^4 - 3x^2 + 2 = 0$ f. $3|x-4| = 10$
g. $2x(4-x)^{\frac{1}{2}} - 3\sqrt{4-x} = 0$

9. Solve each inequality. Write your answer using interval notation.

a. $-4 < 5 - 3x \leq 17$

b. $x^2 < 2x + 8$

c. $x(x-1)(x+2) > 0$

d. $|x-4| < 3$

e. $\frac{2x-3}{x+1} \leq 1$

10. State whether each equation is true or false.

a. $(p+q)^2 = p^2 + q^2$

b. $\sqrt{(p+q)^2} = p+q$

c. $\sqrt{ab} = \sqrt{a}\sqrt{b}$

d. $\frac{1+TC}{C} = 1+T$

e. $\frac{1}{x-y} = \frac{1}{x} - \frac{1}{y}$

f. $\frac{\frac{1}{x}}{\frac{a-b}{x}} = \frac{1}{a-b}$

11. Determine an equation for the line that passes through the point (2, -5) and

a. has a slope of -3.

b. is parallel to the x -axis.

c. is parallel to the y -axis.

d. is parallel to the line $2x - 4y = 3$.

12. Determine an equation for the circle that has center (-1,4) and passes through the point (3, -2).

13. Determine the center and radius of the circle with equation $x^2 + y^2 - 6x + 10y + 9 = 0$.

14. Let $A(-7, 4)$ and $B(5, -12)$ be points in the plane.

a. Determine the slope of the line that contains A and B .

b. Determine an equation of the line that passes through A and B . What are the intercepts?

c. Determine the midpoint of the segment AB .

d. Determine the length of the segment AB .

e. Determine an equation of the perpendicular bisector of AB .

f. Determine an equation of the circle for which AB is a diameter.

15. Sketch the region in the xy -plane defined by the equation or inequalities.

a. $-1 \leq y \leq 3$

b. $|x| < 4$ and $|y| < 2$

c. $y < 1 - \frac{1}{2}x$

d. $y \geq x^2 - 1$

e. $x^2 + y^2 < 4$

f. $9x^2 + 16y^2 = 144$

16. Convert from degrees to radians.

a. 300°

b. -18°

17. Convert from radians to degrees.

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

b. 2

18. Determine the length of an arc of a circle with radius 12 cm if the arc subtends a central angle of 30° .

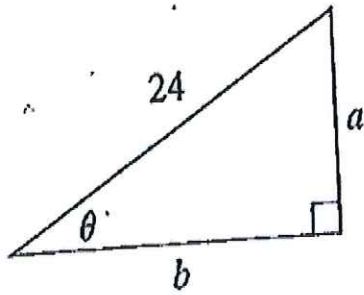
19. Determine the exact values.

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

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

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

20. Express the lengths a and b in the figure in terms of θ .



21. If $\sin x = \frac{1}{3}$ and $\sec y = \frac{5}{4}$, where x and y lie between 0 and $\frac{\pi}{2}$, evaluate $\sin(x+y)$.

22. Prove the identities.

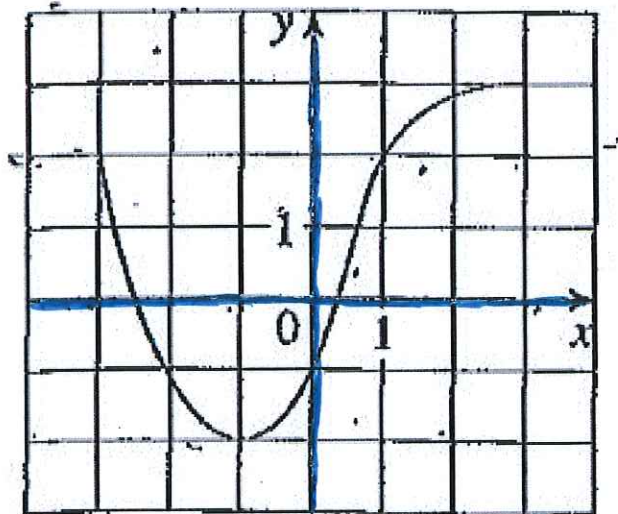
a. $\tan \theta \sin \theta + \cos \theta = \sec \theta$

b. $\frac{2 \tan x}{1 + \tan^2 x} = \sin 2x$

23. Determine all values of x such that $\sin 2x = \sin x$ and $0 \leq x \leq 2\pi$.

24. Sketch the graph of the function $y = 1 + \sin 2x$ with using a calculator.

25. The graph of a function f is given below.



- State the value of $f(-1)$.
- Estimate the value of $f(2)$.
- For what values of x is $f(x) = 2$?
- Estimate the values of x such that $f(x) = 0$.
- State the domain and range of f .

26. If $f(x) = x^3$, evaluate the difference quotient $\frac{f(2+h) - f(2)}{h}$ and simplify your answer.

27. Find the domain of the function.

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

b. $g(x) = \frac{\sqrt[3]{x}}{x^2+1}$

c. $h(x) = \sqrt{4-x} + \sqrt{x^2-1}$

28. How are graphs of the functions obtained from the graph of f ?

a. $y = -f(x)$

b. $y = 2f(x) - 1$

c. $y = f(x-3) + 2$

29. Without a calculator, make a rough sketch of the graph.

a. $y = x^3$

b. $y = (x+1)^3$

c. $y = (x-2)^3 + 3$

d. $y = 4 - x^2$

e. $y = \sqrt{x}$

f. $y = 2\sqrt{x}$

g. $y = -2^x$

h. $y = 1 + x^{-1}$

30. Let $f(x) = \begin{cases} 1-x^2 & \text{if } x \leq 0 \\ 2x+1 & \text{if } x > 0 \end{cases}$

a. Evaluate $f(-2)$ and $f(1)$.

b. Sketch the graph of f .

31. If $f(x) = x^2 + 2x - 1$ and $g(x) = 2x - 3$, determine each of the following functions.

a. $f \circ g$

b. $g \circ f$

c. $g \circ g \circ g$