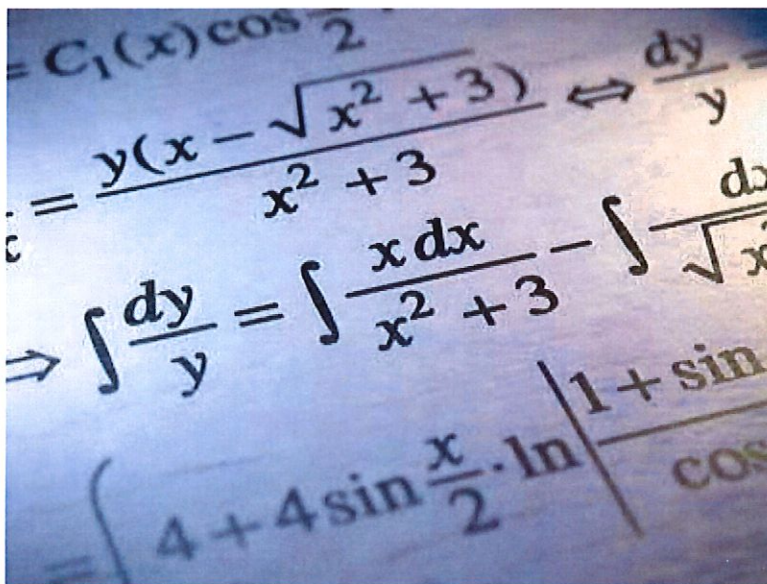


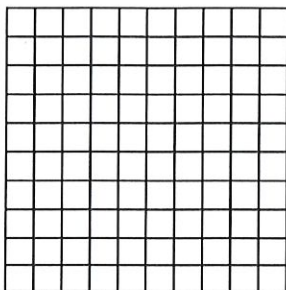
SUMMER PACKET FOR AP CALCULUS


$$= C_1(x) \cos^2 \frac{x}{2}$$
$$= \frac{y(x - \sqrt{x^2 + 3})}{x^2 + 3} \Leftrightarrow \frac{dy}{y} =$$
$$\Rightarrow \int \frac{dy}{y} = \int \frac{x dx}{x^2 + 3} - \int \frac{dx}{\sqrt{x^2 + 3}}$$
$$= \left(4 + 4 \sin \frac{x}{2} \cdot \ln \left| \frac{1 + \sin \frac{x}{2}}{\cos \frac{x}{2}} \right| \right)$$

Name: _____

1. Simplify $\frac{5(x+h)^3 - 5x^3}{h}$.

2. Sketch the graph of the piecewise function. $f(x) = \begin{cases} \sqrt{x-2} + 1, & x > 2 \\ \frac{1}{2}x - 1, & 0 < x \leq 2 \\ x^2 - 1, & x \leq 0 \end{cases}$



3. Find the domain and range of each function. Find any symmetry (with respect to y-axis or origin).

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

b). $g(x) = 2\cos(x) + 3$

c). $h(x) = \frac{x}{x^2 - 4}$

4. Factor: $4x^4 - 19x^3 - 5x^2$

5. Solve the polynomial inequality: $2x^3 - 11x^2 - 6x \leq 0$

6. Find y- and x-intercepts of the line which can be modeled by the equation $\frac{A}{B}x + \frac{1}{C}y = 5$. (A, B, C – are constants)

7. The equation of line L is $8x - 14y = -3$.

a) For what value of k is the graph of $kx - 7y + 10 = 0$ parallel to line L?

b) For what value of k is the graph of $kx - 7y + 10 = 0$ perpendicular to line L?

8. Write as a logarithm of a single expression: $\frac{1}{2}\log_b(3x+1) - \frac{2}{3}\log_b(1-9x^2) + \log_b(1-x)$

9. Solve for x : $\frac{1}{\sqrt{x-2}} - \frac{2(x-2)^{1/2}}{x+1} = 0$

10. Solve for t : $\frac{d}{t+r} = \frac{5}{t}$

11. Solve for y' : $3xy' - 2yy' = k$

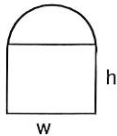
12. For $f(x) = \frac{1}{x^2}$, find $\frac{f(x+h) - f(x)}{h}$.

13. Evaluate the expression at the specified value of x .

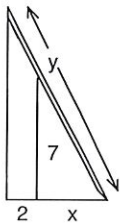
$$(3x^3 + 3)^{-\frac{2}{3}}, \quad x = 2$$

14. At what points do the curves $f(x) = 2x^2 + x - 5$ and $g(x) = x^2 - x + 3$ intersect?

15. Find an expression for the area of the window as shown. It consists of a rectangle of height h and width w , with a semicircle mounted on top of the rectangle.



16. A ladder is leaning against a wall and touches the top of a 7' fence which is 2' away from the wall. Express y , the length of the ladder required, as a function of x , the distance along the ground from the ladder to the fence.

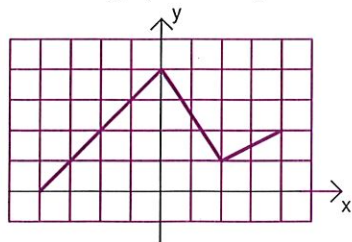


17. For $f(x) = \sqrt{x^2 + 1}$ and $g(x) = \frac{1}{x}$, find the functions $(f+g)(x)$, $(f \cdot g)(x)$, $(f \circ g)(x)$, $(g \circ f)(x)$, and $(f \circ f)(x)$.

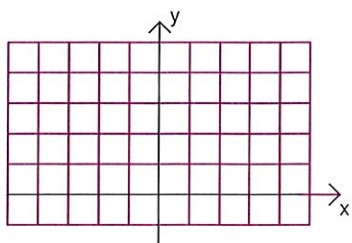
18. Given $F(x) = \cos^2(x + 9)$, find the functions f , g , and h , such that $F(x) = f(g(h(x)))$

19. A ship is anchored five miles from the nearest point P on shore. A person plans to row a straight line from the ship to a point x miles downstream from P . Find an expression for the distance the person will have to row.

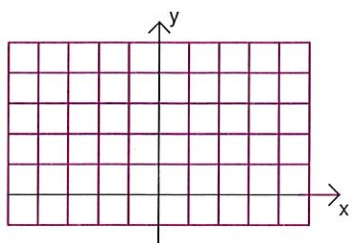
20. The graph of f is given. Draw the graphs of the following functions.



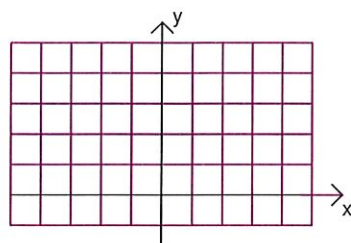
a) $y = f(x+1)$



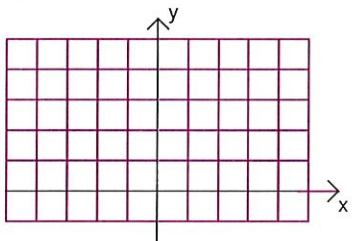
b) $y = f(x)+1$



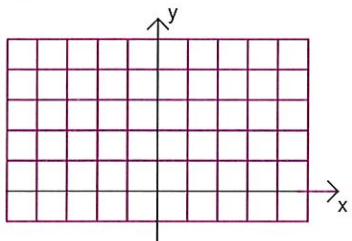
c) $y = \frac{1}{2}f(x)+2$



d) $y = -f(x)+3$



e) $y = f(2x)$



21. Write an equation for the line $y = f(x)$, where f has the following values:

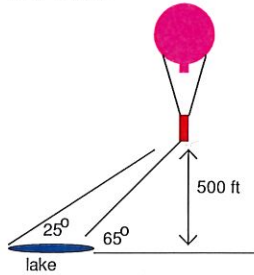
x	-2	2	4
$f(x)$	4	2	1

22. Find the points of intersections of the two curves $f(x) = 2^x$ and $g(x) = 3$.

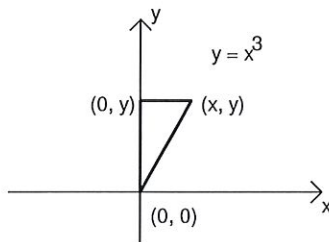
23. Find exact value of the expression $5^{\log_5 6 + \log_5 7}$

24. Use algebra to solve: $\log_3(x+1) + \log_3(x-1) = 2$

25. From a stationary hot air balloon 500 ft above the ground, two sightings of a lake are made. How long is the lake?



26. A right triangle has one vertex on the graph of $y = x^3$, $x > 0$, at (x, y) , another at the origin, and the third on the positive y -axis at $(0, y)$, as shown. Express the area A of the triangle as a function of x .



27. Determine whether the given quadratic function has a maximum value or a minimum value, and then find the value.

$$y = -x^2 - 10x - 3$$

28. If $f(x) = \frac{2x-a}{x-3}$ and $f(4) = 0$, what is the value of a ? Where is f not defined?

29. Write the partial fractions decomposition of $f(x) = \frac{x}{x^2 - 5x + 6}$

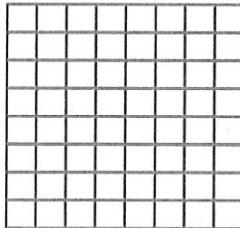
30. Write the following expression as single quotient in which only positive exponents appear:

$$(x^2 + 1)^{1/2} + x \cdot \frac{1}{2}(x^2 + 1)^{-1/2} \cdot 2x$$

31. Factor: $4x^{1/3}(2x+1) + 2x^{4/3}$

32. Use the **signum function**. The signum function is defined by $\text{sgn}(x) = \begin{cases} -1, & x < 0 \\ 0, & x = 0 \\ 1, & x > 0 \end{cases}$.

Sketch the graph of $\text{sgn}(x)$.



Find the following limits (if possible):

a) $\lim_{x \rightarrow 0^-} \text{sgn}(x)$

b) $\lim_{x \rightarrow 0^+} \text{sgn}(x)$

c) $\lim_{x \rightarrow 0} \text{sgn}(x)$

33. Find the limit: $\lim_{x \rightarrow 2} (3x^2 + 6)$

34. Find the limit: $\lim_{x \rightarrow 1} f(x)$, if $f(x) = \begin{cases} x^2 + 4, & x \neq 1 \\ 2, & x = 1 \end{cases}$

35. Find the horizontal asymptote (if any) for $f(x) = \frac{ax^3}{b + cx + dx^2}$

36. Find the horizontal asymptote (if any): $f(x) = \frac{2x-3}{x+2} + \frac{3}{x-5}$

37. Find the value(s) of x for which $f(x) = \frac{2x+6}{x^2-9}$ is discontinuous and label these discontinuities.

38. Determine the intervals on which $f(x)$ is continuous, $f(x) = \tan(0.5x)$

39. Let $f(x) = \frac{1}{|x|}$ and $g(x) = x - 1$. Find all the values of x for which $f(g(x))$ is discontinuous.

40. Find all vertical asymptotes of $f(x)$ if $f(x) = \frac{-3x+3}{(x-1)(x^2+x-1)}$

41. Find the inverse of $f(x) = x^2 - 2$ for $x \geq 0$, and call it $g(x)$. Graph both $f(x)$ and $g(x)$. Are they symmetric? If so, about what?

42. Give an example of a function that does not have an inverse.

43. Is $f(x) = \sin x$ an even or an odd function (or neither)? Why?

44. Is $f(x) = \cos x$ an even or an odd function (or neither)? Why?

45. Is $f(x) = x^3 + 1$ an even or an odd function (or neither)? Why?