

AP Calculus AB Summer Assignment

You must show ALL work on SEPARATE PAPER for credit! All answers should be in EXACT form unless otherwise stated!

#1-30 No Calculators!!

1) Simplify: a) $\frac{x^3 - 9x}{x^2 - 7x + 12}$

b) $\frac{x^2 - 2x - 8}{x^3 + x^2 - 2x}$

c) $\frac{\frac{1}{x} - \frac{1}{5}}{\frac{1}{x^2} - \frac{1}{25}}$

d) $\frac{9 - x^{-2}}{3 + x^{-1}}$

e) $\frac{2}{\sqrt{3} + \sqrt{2}}$

f) $\frac{\sqrt{x-2} + \frac{5}{\sqrt{x-2}}}{x-2}$

2) Solve for x :

a) $5^{(x+1)} = 25$

b) $\frac{1}{3} = 3^{2x+2}$

c) $\log_2 x = 3$

d) $\log_3 x^2 = 2 \log_3 4 - 4 \log_3 5$

3) Solve for y' : $xy' + y = 1 + y'$

4) Simplify: a) $\log_2 5 + \log_2(x^2 - 1) - \log_2(x - 1)$

b) $2 \log_4 9 - \log_2 3$

c) $3^{2 \log_3 5}$

d) $\log_{10}(10^{1/2})$

e) $2 \log_{10} \sqrt{x} + 3 \log_{10} x^{1/3}$

5) Solve each equation: a) $4x^2 - 21x - 18 = 0$ b) $2x^2 - 5x + 3 = 0$ c) $x^4 - 9x^2 + 8 = 0$

6) Find the equation of the line that passes through the point (2, 4) and is parallel to the line $2x + 3y - 8 = 0$.

7) Find the equation of the line that is perpendicular to the line $2x + 3y - 8 = 0$ at the point (1, 2)

8) The line with the slope 5 that passes through the point (-1, 3) intersects the x axis at a point. What are the coordinates of this point?

9) What are the coordinates of the point at which the line passing through the points (1, -3) and (-2, 4) intersects the y axis?

10) Evaluate: a) $\cos 0$ b) $\sin 0$ c) $\tan \frac{\pi}{2}$ d) $\cos \frac{\pi}{4}$ e) $\sin \frac{\pi}{2}$ f) $\sin \pi$

(Radians only!) g) $\arccos \frac{\sqrt{3}}{2}$ f) $\arctan 1 =$ h) $\arcsin(-\frac{1}{2})$

11) Solve over $0 < \theta \leq 2\pi$

a) $2 \sin^2 \theta = 1 - \sin \theta$ b) $2 \tan \theta - \sec^2 \theta = 0$
c) $\sin 2\theta + \sin \theta = 0$ d) $3 \tan^3 \theta - 3 \tan^2 \theta - \tan \theta + 1 = 0$

12) A seven foot ladder, leaning against a wall, touches the wall x feet above the ground. Write an expression (in terms of x) for the distance from the foot of the ladder to the base of the wall.

13) A piece of wire 5 inches long is to be cut into two pieces. One piece is x inches long and is to be bent into the shape of a square. The other piece is to be bent into the shape of a circle. Find an expression for the total area made up by the square and the circle as a function of x .

14) Find the domain for each function:

a) $h(x) = \frac{1}{4x^2 - 21x - 18}$

b) $k(x) = \sqrt{x^2 - 5x - 14}$

c) $y = \ln(2x - 12)$

15) Find $f(x + \Delta x)$ if $f(x) = x^2 - 2x - 3$

16) Find $\frac{f(x + \Delta x) - f(x)}{\Delta x}$ if $f(x) = 8x^2 - 1$

17) Given $f(x) = \frac{1}{x}$ find $\frac{f(x + h) - f(x)}{h}$

18) Solve the equations:

a) $2x + 1 = \frac{5}{x + 2}$ b) $\frac{x + 1}{x} - \frac{x}{x + 1} = 0$

19) Solve for the indicated variable:

a) $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ for a

b) $V = 2(ab + bc + ca)$ for a

c) $A = 2\pi r^2 + 2\pi rh$ for r

d) $\frac{2x}{4\pi} + \frac{1 - x}{2} = 0$ for x

20) Find the remainders on division of:

a) $x^5 - 4x^4 + x^3 - 7x + 1$ by $x + 2$

b) $x^5 - x^4 + x^3 + 2x^2 - x + 4$ by $x^3 + 1$

21) Solve the inequalities:

a) $x^2 + 2x - 3 \leq 0$

b) $\frac{2x - 1}{3x - 2} \leq 1$

c) $x^2 + 2x + 1 > 0$

22) Find the center and radius of the circle: $x^2 + y^2 + 6x - 4y + 3 = 0$

23) Find the equation of the tangent at $(-2, 5)$ for the circle in #22.

24) A circle is tangent to the y -axis at $y = 3$ and has one x -intercept at $x = 1$.

a) Determine the other x -intercept b) Deduce the equation of the circle.

25) Find the inverse of the functions: a) $f(x) = 2x + 3$ b) $f(x) = \frac{x+2}{5x-1}$

26) Write as a single equation in terms of x and y :

a) $\begin{cases} x = t + 1 \\ y = t^2 - t \end{cases}$

b) $\begin{cases} x = \sqrt[3]{t} - 1 \\ y = t^2 - t \end{cases}$

c) $\begin{cases} x = \sin t \\ y = \cos t \end{cases}$

27) A water tank has the shape of a cone (like an ice cream cone without ice cream). The tank is 10m high and has a radius of 3m at the top. If the water is 5m deep (in the middle) what is the surface area of the top of the water?

28) Two cars start moving from the same point. One travels south at 100 km/hr, the other west at 50 km/hr. How far apart are they two hours later?

29) A kite is 100m above the ground. If there are 200m of string out, what is the angle between the string and the horizontal? (Assume that the string is perfectly straight.)

30) For the equations a) $y = x^2 + 4x + 3$ and b) $9y^2 - 6y - 9 - x = 0$, complete the square and simplify to one of the standard forms for a parabola.

You must know how to graph in an appropriate window, find the zeros of a function, and to find points of intersection using your calculator.

Use calculators to:

Sketch and label a graph, then find all roots to the nearest 0.001

31) $f(x) = x^4 - 3x^3 + 2x^2 - 7x - 11$

32) $f(x) = 100x^3 - 203x^2 + 103x - 1$

33) $f(x) = |x - 3| + |x| - 6$

34) $f(x) = 3 \sin(2x) - 4x + 1$ over $[-2\pi, 2\pi]$

Find all points of intersection:

35) $f(x) = 3x + 2$
 $g(x) = -4x - 2$

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