AP Calculus AB Preview Packet

Objective: To give you the opportunity to assess your preparedness for taking Calculus.

You should be familiar with ALL the following topics. If not, then use this preview packet as a guide to what you need to review before starting in the fall. There is not enough time for us to reteach Algebra 1 through precalculus while simultaneously introducing the new calculus concepts. We will be assuming you are comfortable with the following.

Last note: The AP Calculus AB Test is 50% calculator AND 50% NO calculator, so it is important to develop your proficiency with and without the calculator. Try to respect that intention when doing this packet.

Section 1: NO CALCULATOR

Solve the following:

1. $x^3 + 3x^2 - 10x = 0$
2. $x(3x + 10) = 77$
3. $|2x + 5| < 4$

Find the points of intersection:

4. $y = x^2$ and $y = 6x - x^2$
5. $y = x - 2x^2$ and $y = -5x$

Simplify:

6. $x(\sqrt{x} + \sqrt[3]{x})$
7. $\dfrac{3x^2 - 4\sqrt[3]{x} + x}{\sqrt{x}}$
8. $\dfrac{x^3 - 8}{x^3 + 8}$
9. $\dfrac{2x^2 + x - 6}{x^2 + 3x + 2}$
10. $8^{2/3}$
11. $\sqrt{4^5}$
12. $32^{2/5}$

Logarithms:

Find the exact value of each expression:

13. $\ln e^{-100}$
14. $e^{\ln 15}$
15. $\log_{16} 4$
16. $e^{3\ln 2}$
17. $\ln 1$

Express the quantity as a single logarithm

18. $2\ln 4 - \ln 2$
19. $\frac{1}{2} \ln x - 5 \ln (x^2 + 1)$
20. $\ln 3 + 1/3 \ln 8$

Solve each equation for x.

21. $2 \ln x = 1$
22. $5^{x-3} = 25$
23. $2\ln x = \ln 2 + \ln(3x - 4)$

Write the Equation of a line given:

24. (3, 4) and (2, -6)

25. x-intercept 7 passing through (4, 10)

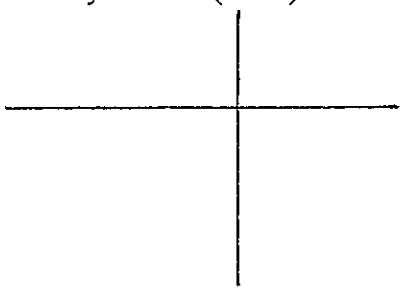
26. A. Find the slope of the line with equation $2x - 5y = 9$

B. Find the equation of the line that passes through (3, -4) and is parallel to the line in part a.

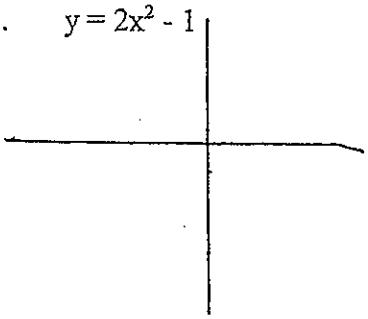
C. Find the equation of the line that passes through (3, -4) and is perpendicular to the line in part a.

Sketch the graph of the following (without a calculator!):

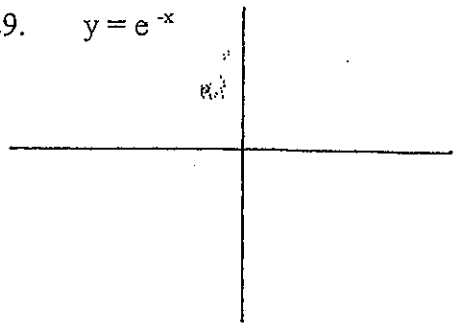
27. $y - 4 = -3(x + 2)$



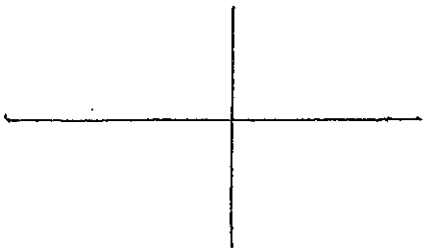
28. $y = 2x^2 - 1$



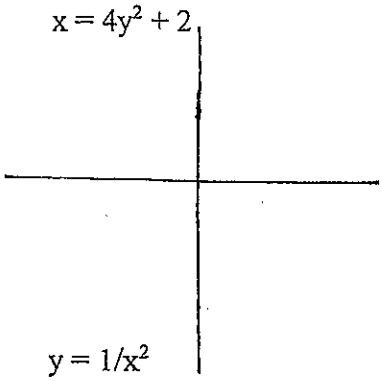
29. $y = e^{-x}$



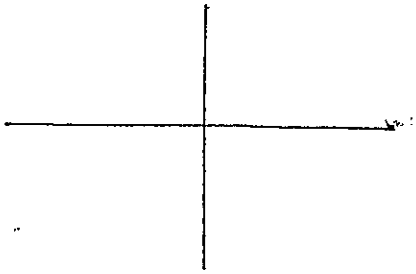
30. $y = \ln x$



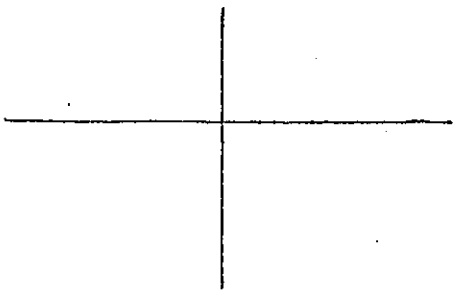
31. $x = 4y^2 + 2$



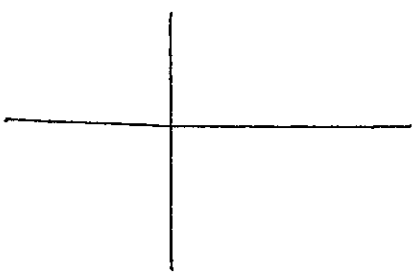
32. $(x + 3)^2 + (y - 2)^2 = 9$



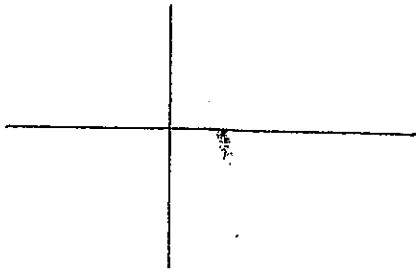
33. $y = 1/x$



34. $y = 1/x^2$

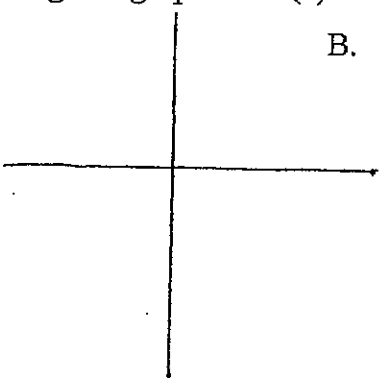


35. $y = 4 + 3\cos 2x$

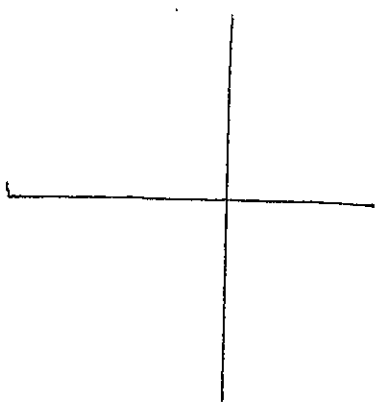


36. Find $f^{-1}(x)$ for the following and graph both f(x) and its inverse on the same axis.

A. $f(x) = 3x + 5$



B. $f(x) = \sqrt{x}$



Trigonometry: Find the exact value:

37. $\sin^{-1}(\frac{1}{2})$ 38. $\cos^{-1}(-\sqrt{3}/2)$ 39. $\sin^{-1}(-\sqrt{2}/2)$

Find all solutions to the equation (still no calculator):

40. $2\cos 2\theta - \sqrt{3} = 0$

41. $2\sin 3\theta + \sqrt{2} = 0$

Section 2: Calculator Required

Solve:

42. $2x^2 - 3x - 4 = 0$ (If you have a quadratic program in your calculator, know how to use it.)

Find the maximum values, the minimum values and the zeros of the following functions:

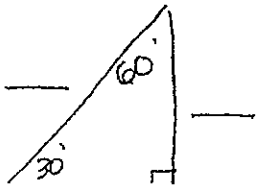
43. $y = 2x^3 - 8x^2 - x + 6$

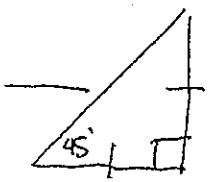
44. $y = 3\sin(x - 8)$ $0 < x < 2\pi$

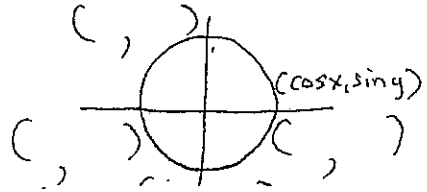
Find the point(s) of intersection of the following:

45. $y = -3x^2 - 4x + 3$ and $y = \sqrt{(x + 8)}$

Quadrant	Radians	Degrees	sin(x)	cos(x)	tan(x)	csc(x)	sec(x)	cot(x)
	0	0						
I	$\pi/6$	30						
I	$\pi/4$	45						
I	$\pi/3$	60						
	$\pi/2$	90						
II	$2\pi/3$	120						
II	$3\pi/4$	135						
II	$5\pi/6$	150						
	π	180						
III	$7\pi/6$	210						
III	$5\pi/4$	225						
III	$4\pi/3$	240						
	$3\pi/2$	270						
IV	$5\pi/3$	300						
IV	$7\pi/4$	315						
IV	$11\pi/6$	330						
	2π	360						



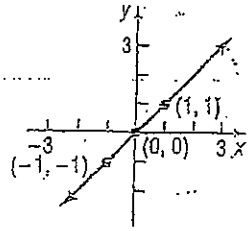




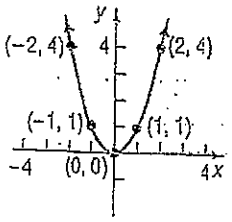
ALSO:

LIBRARY OF FUNCTIONS

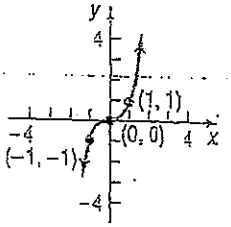
Identity Function
$f(x) = x$



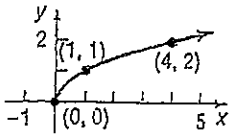
Square Function
$f(x) = x^2$



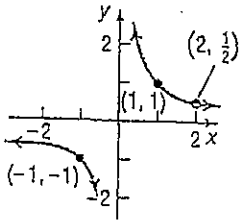
Cube Function
$f(x) = x^3$



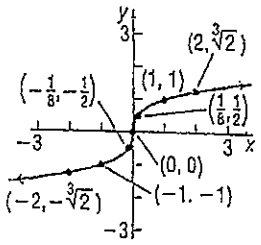
Square Root Function
$f(x) = \sqrt{x}$



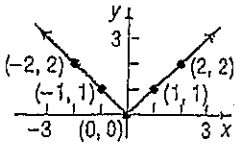
Reciprocal Function
$f(x) = \frac{1}{x}$



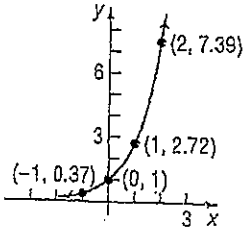
Cube Root Function
$f(x) = \sqrt[3]{x}$



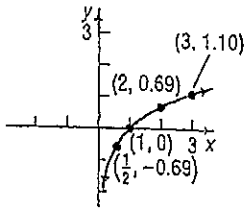
Absolute Value Function
$f(x) = |x|$



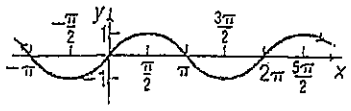
Exponential Function
$f(x) = e^x$



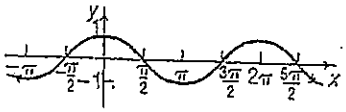
Natural Logarithm Function
$f(x) = \ln x$



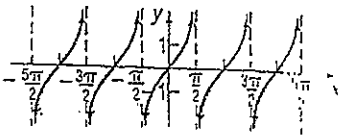
Sine Function
$f(x) = \sin x$



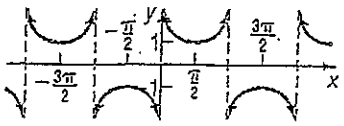
Cosine Function
$f(x) = \cos x$



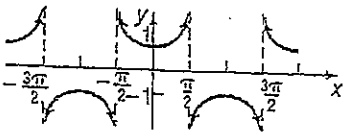
Tangent Function
$f(x) = \tan x$



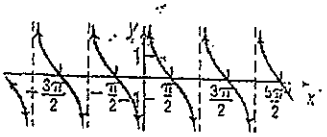
Cosecant Function
$f(x) = \csc x$



Secant Function
$f(x) = \sec x$



Cotangent Function
$f(x) = \cot x$



FORMULAS/EQUATIONS

Distance Formula

If $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$, the distance from P_1 to P_2 is

$$d(P_1, P_2) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Standard Equation of a Circle

The standard equation of a circle of radius r with center at (h, k) is

$$(x - h)^2 + (y - k)^2 = r^2$$

Slope Formula

The slope m of the line containing the points $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$ is

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{if } x_1 \neq x_2$$

$$m \text{ is undefined} \quad \text{if } x_1 = x_2$$

Point–Slope Equation of a Line

The equation of a line with slope m containing the point (x_1, y_1) is

$$y - y_1 = m(x - x_1)$$

Slope–Intercept Equation of a Line

The equation of a line with slope m and y-intercept b is

$$y = mx + b$$

Quadratic Formula

The solutions of the equation $ax^2 + bx + c = 0$, $a \neq 0$, are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

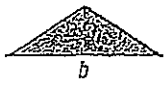
If $b^2 - 4ac > 0$, there are two unequal real solutions.
If $b^2 - 4ac = 0$, there is a repeated real solution.
If $b^2 - 4ac < 0$, there are two complex solutions that are not real.

GEOMETRY FORMULAS

Circle

r = Radius, A = Area, C = Circumference
$A = \pi r^2 \qquad C = 2\pi r$

Triangle

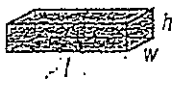


b = Base, h = Altitude (Height), A = area
$A = \frac{1}{2}bh$

Rectangle

l = Length, w = Width, A = area, P = perimeter
$A = lw \qquad P = 2l + 2w$

Rectangular Box



l = Length, w = Width, h = Height, V = Volume, S = Surface area
$V = lwh \qquad S = 2lw + 2lh + 2wh$

Sphere

r = Radius, V = Volume, S = Surface area
$V = \frac{4}{3}\pi r^3 \qquad S = 4\pi r^2$

Right Circular Cylinder

r = Radius, h = Height, V = Volume, S = Surface area
$V = \pi r^2 h \qquad S = 2\pi r^2 + 2\pi rh$