

AP Calculus BC Summer 2008 Work

The following problems are all similar to what you saw in honors precalculus last year. Since I plan on picking up where we left off without much review, it is important to have the concepts and problem solving strategies you learned last year fresh in your mind. Thus, the following problems are to help motivate you to do that, and they are your summer assignment. If you have forgotten how to do a problem, I would suggest reading the appropriate section in your textbook or notes. Do all work on separate sheets of **graph paper**. Also, show work and use proper notation. ALL WORK IS DUE ON OUR FIRST CLASS DAY. Expect a test covering this material at the end of the first week back to school -- little review will be done in class as this is material from prior courses, and it is my expectation that you review such material independently. If you do have questions, however, I am always happy to help outside of class.

Like last year, it is required that you own a graphing calculator for AP Calculus. I strongly recommend the TI-83+ or the TI-89 (as I use these models during in-class demonstrations). If you own another model or would like to get a different brand, please contact me via email to confirm that your calculator can perform the functions required for the class.

1. Compute the slope between each pair of points: $(-1,1)$, $(3,3)$, and $(5,5)$. Are these points collinear (i.e., do they lie on the same line)?
2. Sketch the graph of the line $2x - 3y = 6$.
3. Sketch the graph of $y = 2x^2 + 1$. Identify any x - or y -intercepts. Is this graph symmetric to the y -axis or origin?
4. Given: $f(x) = -x^2 - 2x + 3$, Find: (a) $f(-3)$ (b) $f(x + h)$ (c) $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$
(d) $f'(x)$ (e) $f'(-3)$ (f) the equation of the tangent line to $f(x)$ at $x = -3$.
5. State the domain and range of the following functions: (a) $h(x) = \sqrt{25 - x^2}$ (b) $g(x) = \frac{|x|}{x}$.

6. Given: $f(x) = \sqrt{x}$ and $g(x) = x^2 - 1$, Find: (a) $f(g(5\sqrt{2}))$ (b) $g(f(x))$

7. Solve the following equations: (a) $-2 + x = -6x^2$ (b) $x^3 - x = 0$ (c) $\frac{3}{x-1} + \frac{4}{x-2} = 0$

8. Are the following functions even, odd, or neither? (a) $f(x) = x(4 - x^2)$ (b) $h(x) = 4x - x^2$

9. Evaluate the following without using a calculator:

(a) $\sin\left(\frac{2\pi}{3}\right)$ (b) $\cos(-45^\circ)$ (c) $\tan\left(\frac{3\pi}{4}\right)$ (d) $\sin(630^\circ)$

10. Find the point(s) of intersection of the graphs of $x - y - 1 = 0$ and $y - x^2 = -7$.

11. Find the equation of the line passing through the point (7,3) and having a slope of 2/7.

12. Find the equation of the line passing through the points (7,3) and (-3,4).

13. Find the equation of the line passing through the point (7,3) and is parallel to the x -axis.

14. Find the equation of the line passing through the point (7,3) and is perpendicular to line $y = \frac{1}{2}x - 5$.

15. Suppose the position of a particle moving along the y -axis at any time, t , is given by the equation $y(t) = \frac{t}{3} + t^3 - 2t^2$. Find the particle's velocity when its acceleration is zero.

16. (a) $\lim_{x \rightarrow -3^-} \frac{-3}{x+3}$ (b) $\lim_{x \rightarrow -3^+} \frac{-3}{x+3}$ (c) $\lim_{x \rightarrow -3} \frac{-3}{x+3}$

17. (a) $\lim_{x \rightarrow 0} \frac{\sin x}{x^2 - 3x}$ (b) $\lim_{x \rightarrow 3} \frac{x^2 - 9}{4x^2 - 13x + 3}$ (c) $\lim_{x \rightarrow 3} \frac{x^2 + 9}{x^2 - 4}$

18. Find $f'(x)$ if $f(x) = \cos\sqrt{x}$.

19. Find $f'(x)$ if $f(x) = \sqrt{\cos x}$.

20. Find $f'(x)$ if $f(x) = x \sin^3 x$.

21. Find $f'(4)$ if $f(x) = \sqrt{25 - x^2} - \frac{16}{x}$.

22. Find $\frac{dy}{dx}$ if $y = \frac{3-x}{3x^2-5}$.

23. Find the slope of the tangent line to $x^2 - y - 4x^2y^3 = 6$ at the point (1,-1).

24. All edges of a cube are shrinking at a rate of 0.5 centimeters per second. How fast is the surface area changing when each edge is 3 centimeters? Label your answer.

25. Find the minimum and maximum values of $f(x) = x^2 - 6x$ on the closed interval [2,5]. *Note:* you should not give x -, y -coordinates here; state only the minimum and maximum value of the function (i.e., give only the y -coordinate for each answer).

26. Find $f'(2)$ if $f(x) = \frac{5}{2x^3}$.

27. Given: $f(x) = \frac{x^3}{3} - x^2 - 3x + 2$, Find:

- (a) the open intervals over which $f(x)$ is increasing and decreasing.
- (b) the x -, y -coordinates of any relative extrema (and specify whether the point in question is a relative maximum or minimum).
- (c) the open intervals over which $f(x)$ is concave up/down.
- (d) the x -, y -coordinates of any inflection points.