

Next Year's AP Calculus AB Students

As you probably know, the students who take AP Calculus AB and pass the Advanced Placement Test will place out of one semester of college Calculus. Attached is a summer homework packet, which will be due the August 28th. The material in the packet should be material you learned in Algebra II and Precalculus.

You will turn in the packet any time between the first day of class and August 28th, and it will count as a test grade.

Do your work on notebook paper and there is one question that needs to be on graph paper. My recommendation is that you look over and work the problems in the packet when you receive it, but you need to go back over it the week before school so that you will remember the material when school starts. I will have study sessions in August for you to get help on the questions. Most of this information you must memorize for next school year. There will be many memory quizzes.

Please email me with any questions that you may have on the summer assignment. I will respond as quickly as I can. My email address is ddittberner@mfisd.txed.net.

We will be using the TI-Nspire CAS calculators. They will be provided to you by the school. If you are interested in purchasing one, please let me know and I will help you pick out the correct calculator.

I am looking forward to seeing you in Calculus in August.

D. DITTBERNER,
AP CALCULUS AB TEACHER

Are you ready for Calculus?

1. Simplify: a) $\frac{x^3 - 25x}{x^2 - 8x + 15}$ b) $\frac{x^2 - 7x - 8}{x^3 + 4x^2 - 5x}$ c) $\frac{\frac{1}{x} - \frac{1}{6}}{\frac{1}{x^2} - \frac{1}{36}}$ d) $\frac{4 - x^{-2}}{2 + x^{-1}}$

2. Rationalize the denominator: a) $\frac{3}{\sqrt{5} + \sqrt{7}}$ b) $\frac{4}{1 - \sqrt{7}}$ c) $\frac{2 - \sqrt{7}}{4 + \sqrt{3}}$

3. Simplify the following expressions:

a) $\frac{(3a^3)^3}{b^2}$ b) $\sqrt{16ab^5}$ c) $\frac{2\left(\frac{a}{b}\right)}{\frac{3}{a}}$ d) $\frac{cb + c}{b^2 + b}$ e) $\frac{a^{-2}}{(b^{-2})\sqrt{a}}$ f) $\left(\frac{a^{2/3}}{b^{1/2}}\right)^3 \left(\frac{b^{3/2}}{a^{1/2}}\right)$

4. Solve for x (do not use a calculator):

a) $7^{(x+1)} = 49$ b) $\frac{1}{5} = 5^{2x+4}$ c) $\log_4 x = 5$ d) $\log_3 x^2 = 4\log_3 2 - 2\log_3 25$

5. Simplify: a) $\log_2 7 + \log_2(x^2 - 1) - \log_2(x + 1)$ b) $2^{3\log_2 5}$

6. Simplify: a) $\log_2 32$ b) $\log \frac{1}{10^{4x}}$ c) $3\log_{10} \sqrt[3]{x} + 2\log_{10} x^{1/2}$

7. Solve the following equations for the indicated variables:

a) $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$, for c b) $V = 2(ab + bc + ca)$, for b
c) $A = 2\pi r^2 + 2\pi rh$, for positive r d) $A = P + nrP$, for P
e) $2x - 2yd = y + xd$, for x f) $\frac{2x}{7\pi} + \frac{1-x}{2} = 0$, for x

8. Factor completely:

a) $x^8 - 625x^4$ b) $4x^3 - 8x^2 - 25x + 50$ c) $27x^3 + 64$ d) $x^4 - 16$

9. Find all real solutions to:

a) $x^8 - 625x^4 = 0$ b) $4x^3 - 8x^2 - 25x + 50 = 0$ c) $27x^3 + 64 = 0$

10. Solve for x:

a) $3\cos^2 x = \sin^2 x$; $0 \leq x < 2\pi$ b) $\cos^2 x - \sin^2 x = \cos x$; $-\pi < x \leq \pi$
c) $\cot x + \csc x = 2\sin x$; $-\infty < x < \infty$

11. Solve the equations: a) $3x^2 - 8x - 3 = 0$ b) $\frac{3x}{5} + \frac{4}{x} = \frac{4x+1}{5}$

c) $\frac{5}{x^2 - 7x + 12} - \frac{2}{3 - x} = \frac{5}{x - 4}$

12. Determine the equations of the following lines:

a) the line through (-3,1) and (5,-9)

b) the line through (-2,1) and perpendicular to the line $4x - 3y - 5 = 0$.

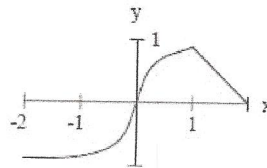
c) the line through (2,3) and the midpoint of the line segment from (-1,4) to (3,2).

13. Find the point of intersection of the lines: $6x - y - 31 = 0$ and $4x + 3y - 17 = 0$

14. Simplify $\frac{f(x+h) - f(x)}{h}$, where a) $f(x) = 4x + 5$ b) $f(x) = \frac{1}{2x+1}$ c) $f(x) = (x+2)^3$

15. The graph of the function $y = f(x)$ is given as follows: Determine the graphs of the functions:

- a) $f(x+2)$ b) $-f(-x)$
 c) $|f(x)|$ d) $f(|x|)$

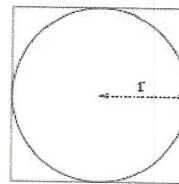


16. a) The equation $2x^3 - 3x^2 - 18x - 8 = 0$ has a solution $x=4$. Find all other solutions using long division.

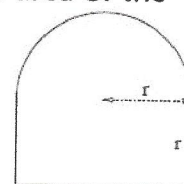
b) Solve for x , the equation $12x^3 + 8x^2 - x - 1 = 0$. All solutions are rational and between -1 and 1.

17. a) Find the ratio of the area inside the square but outside the circle to the area of the square in terms of y in the picture (a) below.

$r = 3y$



(a)



(b)

b) Find a formula for the perimeter of a window in terms of y of the shape in the picture (b) above.

c) A water tank has the shape of a cone (like an ice cream cone without the ice cream). The tank is 20m high and has a radius of 6m at the top. If the water is 12m deep (in the middle) what is the surface area of the top of the water?

d) Two cars start moving from the same point. One travels south at 240 km/hour, the other west at 300 km/hour. How far apart are they two hours later?

e) A kite is 200m above the ground. If there are 750m of string out, what is the angle between the string and the horizontal? (Assume that the string is perfectly straight.)

Things you should know by heart for Calculus

Find the following and memorize

Slope and Linear Equations:

The slope of the line through points (x_1, y_1) and (x_2, y_2) :

The relationship of the slopes of parallel lines with slopes m_1 and m_2 :

The relationship of the slopes of perpendicular lines with slopes m_1 and m_2 :

The point/slope equation of a line:

The standard equation of a line:

The slope/intercept equation of a line:

Factoring:

The difference between two squares:

The difference of two cubes:

The sum of two cubes:

The perfect square trinomial:

Distance, Quadratic, and Midpoint Formulas:

State the distance formula for the distance between points (x_1, y_1) and (x_2, y_2) :

State the quadratic formula for finding the roots to the quadratic equation $ax^2 + bx + c = 0$:

State the midpoint of the line segment between points (x_1, y_1) and (x_2, y_2) :

Asymptotes of Rational Functions:

What are the zeros of the numerator:

What are the zeros of the denominator:

How do you get a removable discontinuity:

How do you find a horizontal asymptote:

How do you find a slant asymptote:

Parent Functions:

You need to know the a) equation, b) graph, c) domain, and d) range of the following:

Constant, Identity, Quadratic, Absolute Value, Rational, Square Root, Cubic, Cube Root, Sine
Cosine, and Tangent

Trig Identities:

You need to know all of the following identities: Quotient, Reciprocal, Pythagorean, and
Double Angle

Trig Values:

You should know all the values of sine, cosine, and tangent for the unit circle using radian
measures without sketching the unit circle.