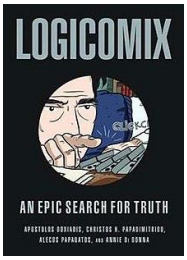
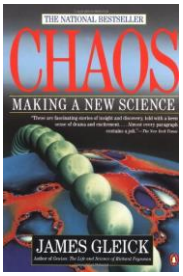
12th Grade Assignment – Week #16

Announcement – Books to Purchase:



- Beginning in Week #21, we will have an extensive unit on the *Philosophy of Math*. This course will require a significant amount of reading, followed by discussion. Much of the reading material will be a collection of short articles that you can download. But an important part of the reading will be the following book, which you will need: ***Logicomix: An Epic Search for Truth*** by Apostolos Doxiadis and Christos Papadimitriou. It may be possible to find an online pdf of the book, but I think it would be worthwhile for you to purchase your own copy.



- Beginning in Week #29, there will be a main lesson on *Fractal Geometry & Chaos*. There will be a book required for this course too, and now would be a good time to purchase it: ***Chaos: Making a New Science*** *(James Gleick)*. (The book was first published in 1988, and became massively popular. In 2008, after more than a million copies had been sold, they released a special 20th-anniversary edition. It includes all of six pages of a new afterword, but is identical to the 1988 version otherwise. Any copy you get will be fine.)
- **Please do not read either of these books ahead of time!**

Group Assignments:

for Tuesday

Do **Problem Set #4** (*Calculus – Part I*), pr #4-6.

for Thursday

- Do **Problem Set #5** (*Calculus – Part I*), in the following order: #8, 9, 5, 6, 7
- If you still have extra time, help each other with some of the more difficult problems from the individual work (below).

Individual Work

- Do **Problem Set #5** (*Calculus – Part I*), pr #1-4.

Problem Set #4 (continued)

4) Derivative Practice.

a) Find $\frac{d}{dx}(x^3 + 7x^2 - 3\sin x)$

b) Find $\frac{d}{dx}(5\sin^2 x)$

c) Find $\frac{d}{dx}\left(\frac{1}{\cos^3 x}\right)$

d) Find $\frac{d}{dx}(e^x \cos x)$

5) Find $\frac{dy}{dx}$.

a) $y = \tan x$

b) $y = \cot x$

c) $y = \sec x$

d) $y = \csc x$

e) $y = \frac{x^3}{x - 4}$

6) Find f '(x).

a) $f(x) = (\sin x + 3)^5$

b) $f(x) = \sin(x^5 + 3)$

c) $f(x) = \frac{5}{e^x}$

d) $f(x) = e^{3x}$

e) $f(x) = \sqrt{1 - x^2}$

f) $f(x) = \cos(3x^4) + \cos x$

g) $f(x) = \cos(3x^4)\cdot\cos x$

h) $f(x) = \ln(3x)$

i) $f(x) = \ln(¼x)$

j) $f(x) = \ln(ax)$

k) What do the above three problems tell us?

Problem Set #5

1) Find f '(x).

a) $f(x) = \cos(½x)$

b) $f(x) = \frac{\sin x}{4x^2}$

c) $f(x) = \sin x\cdot\cos x$

d) $f(x) = \sin^2 x\cdot\cos x$

e) $f(x) = \frac{x^2 + 3}{x - 3}$

f) $f(x) = \frac{1}{(x + 3)^5}$

g) $f(x) = \frac{1}{(4x + 3)^5}$

h) $f(x) = \tan^3 x$

2) Find f '(x).

a) $f(x) = \frac{1}{\sqrt{x}}$

b) $f(x) = \frac{3x+2}{2x-1}$

c) $f(x) = \csc(x^3)$

d) $f(x) = 4x\cos x$

e) $f(x) = \cos(4x)$

f) $f(x) = \sqrt{\cos^2 x + 1}$

g) $f(x) = ⅓\ln(x^3)$

h) $f(x) = x^3 \ln x$

i) $f(x) = \frac{\ln x}{x^3}$

3) Find the slope of…

a) $f(x) = \sin x$ at $x = \pi/3$

b) $f(x) = \cos x$ at $x = 0$

c) $f(x) = e^x$ at $x = 1$

d) $f(x) = \ln x$ at $x = 5$

e) $f(x) = \ln(4x)$ at $x = 5$

f) $f(x) = \ln x$ at $x = ⅔$

4) Evaluate the integrals.

a) $\int_0^{\pi/4} \sin x\,dx$

b) $\int_{\pi/6}^{\pi/3} \cos x\,dx$

c) $\int_1^{10} \frac{1}{x}\,dx$

d) $\int_{-\infty}^{0} e^x\,dx$

e) $\int_{-\infty}^{1} e^x\,dx$

5) a) Given $f(x) = 5^x$ find $\frac{dy}{dx}$. (Hint: Change the base!)

b) Given $f(x) = 5^x$ find F(x).

6) a) Given $f(x) = a^x$ find $\frac{dy}{dx}$.

b) Given $f(x) = a^x$ find F(x).

7) Find $\frac{d}{dx}(\log_2 x)$

8) Given $f(x) = \frac{1}{x}$ …

a) What is the area of the region bounded by the curve, the x-axis, and to the right of the line x = 1?

b) What is the volume of the vortex (i.e., funnel) that is created by rotating the above area about the x-axis?

9) Given $f(x) = \frac{1}{x^2}$ …

a) What is the area of the region bounded by the curve, the x-axis, and to the right of the line x = 1

b) What is the volume of the vortex that is created by rotating the above area about the x-axis?