GMP V into VI Summer Homework

Name: _____

- This homework will be your first GMP VI assignment
- This is not meant to be done in one sitting. Plan ahead and pace yourself so that you are doing only a few problems at a time. You will get much more out of it this way.
- All work is to be done and handed in on a separate sheet of paper
- We encourage you to use online lessons to review these topics, such as Kahn Academy, Purple Math, or UB's math department lessons: http://motherhen.eng.buffalo.edu/

Problem 1: State the derivative

a) $y = n^x$
b) $y = e^x$
c) $y = \ln x$
d) $y = \sin x$
e) $y = \cos x$
f) $y = \tan x$
g) $y = \csc x$
h) $y = \sec x$
i) $y = \cot x$
j) $y = \sin^{-1} x$
k) $y = \cos^{-1} x$
l) $y = \tan^{-1} x$

Problems 2-9: Find $\frac{dy}{dx}$

2) $y = (x^2 + x^3)^4$
3) $y = \frac{x^4-1}{x^4+1}$
4) $y = \sqrt{x}\cos\sqrt{x}$
5) $y + x\cos y = (x^2)y$
6) $y = (1 - x^{-1})^{-1}$
7) $y = e^{x\sec x}$
8) $y = \frac{(x^2+1)^4}{(2x+1)^3(3x-1)^5}$
9) $y = \tan^{-1}\sin^{-1}\sqrt{x}$

Problems 10-17: Evaluate the integral

10) $\int_1^2 \frac{x}{(x+1)^2}\,dx$
11) $\int \frac{1}{2x^2+3x+1}\,dx$
12) $\int_0^{\frac{\pi}{2}} \cos^{3x}\sin 2x\,dx$
13) $\int \frac{x^2}{(4-x^2)^{\frac{3}{2}}}\,dx$
14) $\int_0^{\frac{1}{2}} \frac{xe^{2x}}{(1+2x)^2}\,dx$
15) $\int \tan^5 x \sec^3 x\,dx$
16) $\int e^x \cos x\,dx$
17) $\int \frac{2^{\sqrt{x}}}{\sqrt{x}}\,dx$

Recall the arc length formula: $L = \int \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\,dx$

Problems 18-19: Find the exact length of the curve

18) $y = \frac{x^3}{3} + \frac{1}{4x}$, $1 \le x \le 2$
19) $x = \frac{1}{3}\sqrt{y}(y-3)$, $1 \le y \le 9$

20) Find the length of the arc of the curve from point P to point Q

$y = \frac{1}{2}x^2$, P$(-1, \frac{1}{2})$, Q$(1, \frac{1}{2})$

Problems 21-24: Find the exact area of the surface by rotating the curve about the x-axis

21) $y = x^3, 0 \leq x \leq 2$

22) $y^2 = x + 1, 0 \leq x \leq 3$

23) $y = \cos\frac{1}{2x}, 0 \leq x \leq \pi$

24) $x = 1 + 2y^2, 1 \leq y \leq 2$

Problems 25-26: The given curve is rotated about the y-axis. Find the area of the resulting surface

25) $y = \frac{1}{3}x^{\frac{2}{3}}, 0 \leq x \leq 12$

26) $x = \sqrt{a^2 - y^2}, 0 \leq y \leq \frac{a}{2}$