(1) (30 points) Compute the following antiderivatives.

(a) 
$$\int (4x^5 + 2x^3 - 2x^2 + 4x - 5) dx$$

(b) 
$$\int (3\cos\theta + 4\sin\theta) \, d\theta$$

(c) 
$$\int \sqrt{t} dt$$

(d) 
$$\int \frac{7}{y^4} dy$$

(e) 
$$\int \frac{3s^2 - 4s}{s^4} \, ds$$

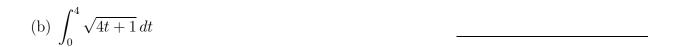
(f) 
$$\int x\sqrt{x^2+4}\,dx$$

(g) 
$$\int \frac{\sin \theta}{(2 + \cos \theta)^3} d\theta$$

(h) 
$$\int (y^2+1)\sqrt{y^3+3y+1}\,dy$$

(2) (20 points) Compute the following definite integrals.

(a) 
$$\int_0^2 (3x^2 + 2x + 1) dx$$



(c) 
$$\int_0^{\pi} \sin(\theta/2) d\theta$$

(d) 
$$\int_{-1}^{2} \frac{5x \, dx}{(x^2+1)^3}$$

(3) (5 points) Find the function F(x) such that  $F'(x) = 2 + 4x^3$  and F(1) = 5.

$$F(x) = \underline{\hspace{1cm}}$$

(4) (5 points) Solve 
$$\frac{dy}{dx} = -\frac{2x}{3y}$$
, and  $y(1) = 2$ .

(5) (5 points) Compute 
$$\sum_{k=2}^{5} 3k - 2$$
.

- (6) (10 points)
  - (a) State the mean value theorem.
  - (b) Show that  $|\cos(3b) \cos(3a)| \le 3|b a|$ .

(7) (5 points) Let 
$$f(x) = \begin{cases} x, & 0 \le x \le 2; \\ 4 - x, & 2 < x < 6. \end{cases}$$
 Then find  $\int_0^6 f(x) \, dx$ .

- (8) (10 points)
  - (a) State the first form of the Fundamental Theorem of Calculus.
  - (b) Compute the following:

(i) 
$$\frac{d}{dx} \int_4^x \sin(t^2) dt$$

(ii) 
$$\frac{d}{dx} \int_3^{x^2+1} \sin(t) dt$$

(9) (10 points) Find the area between the curves y=2x and  $y=x^2$ . HINT: Draw the graph and see where the two curves intersect.

Area=
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(10) (5 points) If a is a constant, then compute  $\int_0^a (a-x)^4 dx$