1. Find each requested anti-derivative.

a) $\int x^4 dx$ b) $\int \sqrt[3]{x^2} dx$ c) $\int e^{6x} dx$ d) $\int \frac{5}{x} dx$

2. Find the specific function f(x) which satisfies the following information:

a) $f'(x) = 3x^2 - 8x$ and f(2) = 3

b) $f'(x) = \sqrt{6x-2}$ and f(3) = 1 (Hint: use substitution)

3. Use the Method of Substitution to find the values of each Integral

a) $\int 4x^2(x^3-1)^6 dx$ b) $\int x e^{5x^2+7} dx$

4. Solve the differential equation. Find the function satisfying the given information.

a) $\frac{dy}{dx} = 4x - 6$ *and* $y(2) = 1$

b) $\frac{dy}{dx} = e^{2x} + 3$

5. Estimate the Area under the curve of $f(x) = \frac{1}{9}(x-3)^2 + 4 = \frac{1}{9}x^2 - \frac{2}{3}x + 5$ on the interval [0,12] using n = 4 rectangles and Right-hand endpoints. (Hint: a sketch might help) 12pts

6. Given the following information regarding f(x), answer the questions below.

$\int_1^{10} f(x)dx = 14$, $\int_{10}^{4} f(x)dx = -3$, $\int_1^7 f(x)dx = 6$

a) $\int_1^4 f(x)dx$ b) $\int_4^{10} 2f(x)dx$ c) $\int_4^7 f(x)dx$

7. Find the value of each Definite Integral, **NO DECIMALS**

a) $\int_9^{16} \sqrt{x} dx$ b) $\int_{-3}^{5} (x^4 - 6x^2 + 7)dx$

c) $\int_2^{10} \frac{3}{x} dx$ d) $\int_{-1}^{2} e^{4x} dx$ e) $\int_{-2}^{1} \frac{x^2 - 4x}{x^4} dx$

8. Use the Substitution Method to evaluate the Definite Integrals below

a) $\int_0^2 x(x^2-1)^5\,dx$ b) $\int_{-6}^6 x\sqrt{10-x}\;dx$

9. Find the following anti-derivatives.

a) $\int (10x^4+\frac{2}{x^5})dx$ b) $\int xe^{3x^2}\,dx$

10. Find the specific function f(x) which satisfies all of the following:

a) $f'(x)=\frac{1}{\sqrt{4x+5}}$ *and* $f(11)=2$

b) $f'(x)=x^3-4x$ *and* $f(-6)=4$

11. Evaluate each of the Definite Integrals. NO DECIMAL ANSWERS.

a) $\int_{-2}^2 (2x^3-3x^2)dx$ b) $\int_0^2 36x^2(x^3+1)^5\,dx$

12. Given $\int_2^9 f(x)dx=10,\ \int_9^5 f(x)dx=7,\ \int_5^{13} f(x)dx=16$, find

a) $\int_2^{13} f(x)dx$ b) $\int_{13}^9 5f(x)dx$

13. Find the Area bounded by $y=x^2$ *and* $y=2x+8$

14. Find the Area bounded by $y=x^3$ *and* $y=9x$

15. Ed starts a 401k account at age 27, putting away $6000 each year. If the account earns 7.2% continuously, how much will be in the account when Ed reaches age: (i) 60 (ii) 65 (iii) 70

16. An investment opportunity is presented, which will provide a continuous income stream worth $75000 each year for the next 8 years. Assuming an earnings rate of 5% continuously, what is this worth in today's dollars?

17. Marie has built up a retirement account with a total value of $1,250,000 and wishes to convert it into an annuity that will pay her out over the next 25 years. Assuming an earnings rate of 6.4% continuously, how much will this provide her each year? (Hint: use the PV formula)

18. A PDF is given: $f(x)=\begin{cases}1/10 & 0\le x\le 10\\ 0 & \textit{elsewhere}\end{cases}$

a) Show that this satisfies Principles I and II of a Probability Density Function
b) Use Principle III to find P(2 < X < 8)

19. A PDF is given: $f(x)=\begin{cases}\dfrac{3(1-x^2)}{4} & -1\le x\le 1\\ 0 & \textit{elsewhere}\end{cases}$

a) Show that this satisfies Principles I and II of a Probability Density Function
b) Use Principle III to find P(-1/2 < X < 1/4)

20. Find each Improper Integral's value, if is Converges, or show why it Diverges

a) $\int_2^\infty \frac{3}{x^5}\,dx$ b) $\int_1^\infty \frac{3}{\sqrt[3]{x}}\,dx$ c) $\int_2^\infty \frac{3}{x}\,dx$ d) $\int_1^\infty \frac{1}{2}e^{-t/2}\,dt$