score	possible	problem
	20	1
	30	2
	20	3
	30	4
	100	

Name: ____________________
Name: ____________________
Name: ____________________
Name: ____________________

Work in groups of 3 or 4. Show your work. Aknowledge any help on these specific problems.

/20 1. Use the formula

$$\int_a^b f(x)dx = \lim_{n\to\infty} \sum_{i=1}^{\infty} f(x_i)\Delta x$$

with $\Delta x = (b-a)/n$ and $x_i = a + i\Delta x$ to evaluate the integral

$$\int_0^1 (x^3 - 3x^2)dx\,.$$

/30 2. Suppose f and g are differentiable functions with the following properties:

$$\begin{array}{lll} f(0)=2 & f(1)=0 & f(2)=1 \\ g(0)=1 & g(1)=2 & g(2)=0 \\ \int_0^1 f(x)dx=\pi & \int_1^2 f(x)dx=\pi^3 & \int_2^3 f(x)dx=\pi^5 \\ \int_0^1 g(x)dx=\sqrt{2} & \int_1^2 g(x)dx=\sqrt{3} & \int_2^3 g(x)dx=\sqrt{5} \\ f'(0)=e & f'(1)=e^3 & f'(2)=e^5 \\ g'(0)=\sqrt{7} & g'(1)=\sqrt{11} & g'(2)=\sqrt{13} \end{array}$$

Evaluate the following. If one cannot be evaluated with the given information, write "NOT ENOUGH INFORMATION."

(a) $\int_0^1 f(r)dr$

(b) $\int_0^3 f(x)dx$

(c) $\int_3^2 g(x)dx$

(d) $\int_1^2 (5f(x)+g(x))dx$

(e) $\int_0^1 f(x)g(x)dx$

(f) $\int_0^{14} f(x)dx - \int_2^{14} f(x)dx$

(g) $\int_0^2 f'(r)\ dr$

(h) $\int_6^6 f''(x)\ dx$

(i) $\displaystyle\lim_{x\to 1} \frac{f(x)}{g(x)-2}$

(j) $\displaystyle\lim_{h\to 0} \frac{f(2+h)-1}{h}$

/10 3. (a) Evaluate the integral $\int_{-1}^{2} |x| dx$ by interpreting it in terms of area.

/10 (b) Evaluate the integral $\int_{-1}^{2} x^3 dx$ and interpret it as a difference of areas. Illustrate with a sketch.

4. Evaluate the integrals:

/5 (a) $\displaystyle\int_{-2}^{3}(x^2-3)dx =$

/5 (b) $\displaystyle\int_{1}^{4}\left(\frac{4+6u}{\sqrt{u}}\right)du =$

/5 (c) $\displaystyle\int_{1}^{2}\left(\frac{x}{2}-\frac{2}{x}\right)dx =$

/5 (d) $\displaystyle\int_{1}^{e}\frac{x^2+x+1}{x}dx =$

/5 (e) $\displaystyle\int\frac{\sin(x)}{1-\sin^2(x)}dx =$

/5 (f) $\displaystyle\int\tan(7)dx =$