Name: _____

4-digit code: _____

- Write your name and the last 4 digits of your SSN in the space provided above.

- The test has six (6) pages, including this one.

- Enter your answer in the box(es) provided.

- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.

- Credit for each problem is given in parentheses at the right of the problem number.

- No books, notes or calculators may be used on this test.

Page	Max. points	Your points
2	30	
3	30	
4	20	
5	20	
Total	100	

Problem 1 (20 pts). Evaluate each integral:

(a) $\int \left(5x + \dfrac{2}{3x^5} - \sqrt{2}e^x\right) dx$

(b) $\int \left(3\sin x - 2\sec^2 x\right) dx$

(c) $\int (1 + \sin t)^{90} \cos t \, dt$

(d) $\int \dfrac{5x^4}{(x^5 + 1)^2} \, dx$

Problem 2 (10 pts). Suppose that a point moves along a curve $y = f(x)$ in the xy–plane in such a way that at each point (x, y) on the curve the tangent line has slope $\sin x$. Find an equation for the curve, given that it passes through the point $(0, -2)$.

Problem 3 (30 pts). Sketch the graph of the rational function $f(x) = \dfrac{2x^2 - 8}{x^2 - 16}$.

Indicate clearly:

- x- and y-intercepts.
- Vertical and horizontal asymptotes.
- Intervals of increase, decrease and different concavity.
- Location of relative extrema and inflection points.

Problem 4 (10 pts). Find the absolute extrema of $f(x) = 6x^{4/3} - 3x^{1/3}$ on the interval $[-1, 1]$.

Absolute maximum at

Absolute minimum at

Problem 5 (10 pts). Let $f(x) = \cos x$. Verify that the hypotheses of Rolle's Theorem are satisfied on the interval $\left[\frac{\pi}{2}, 3\frac{\pi}{2}\right]$.

Choose one of the following two story-problems:

Problem 6 (20 pts). The function $s(t) = t^4 - 4t^2 + 4$ describes the position of a particle moving along a coordinate line, where s is in feet and $t \geq 0$ is in seconds.

(a) Find the velocity and acceleration functions.

(b) When is the particle speeding up? Slowing down? (Justify your answers with sign charts).

Problem 7 (20 pts). A container with square base, vertical sides, and open top is to be made from 1000 ft^2 of material. Find the dimensions of the container with greatest volume.

Dimensions of container: