

Work quickly and carefully, following directions closely. Answer all questions completely.

FOR ALL PROBLEMS: Define P , Q , R , and S to be the four digits in your given number.

$$P = \underline{\quad}, \quad Q = \underline{\quad}, \quad R = \underline{\quad}, \quad S = \underline{\quad}.$$

§I. TRUE and/or FALSE. Circle your answer. There are 2 questions at 2 points each.

- TRUE or FALSE: The *Laplace transform* of a periodic function is also periodic.
- TRUE or FALSE: The *Laplace transform* of the function $y = Pe^{(x^2+Q)}$ does not exist. (P and Q are your numbers.)

§II. MULTIPLE CHOICE. Circle your answer. There are 2 question at 5 points each.

- The *Laplace transform* of the *shifted Dirac Delta function* $\delta(t - R)$ (where R is your number) is

(a) $F(s) = e^{-Rs}$

(b) $F(s) = \frac{e^{-Rs}}{s}$

(c) $F(s) = se^{-Rs}$

(d) none of the above

(e) all of the above

- The *inverse Laplace transform* of $F(s) = \frac{Ps}{P^2 + s^2}$ (where P is your number) is

(a) $f(t) = \frac{1}{2}t^{-1}\sin(Pt)$

(b) $f(t) = \frac{1}{2}\sin(Pt)$

(c) $f(t) = \frac{1}{2}t\sin(Pt)$

(d) none of the above

(e) all of the above

§III. PROBLEMS. *You must show your work to receive credit.* There are 3 problems at 10 points each.

- Find the *Laplace transform* of the function $f(t) = e^{-Qt}\sin(t)$. (Q is your number.)



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2. Find the *inverse Laplace transform* of the function $F(s) = \frac{P}{s^2 - P^2}$. (P is your number.)

3. Solve the differential equation $x''(t) + x(t) = \delta(t - Q)$ with $x(0) = 0$ and $x'(0) = 0$. (Q is your number.)



The *Interstate Highway System* was initiated by:

(a) President Eisenhower (1953-61) (b) President Nixon (1969-74) (c) President Reagan (1981-89).