

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.
- You have fifty (50) minutes to complete the exam.
- 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	20	
4	20	
5	30	
<b>Total</b>	100	

**Problem 1** (30 pts). Sketch on the next page the graph of the function  $f(x) = \frac{x}{x-2}$ .

Make sure to indicate clearly:

- Zeros of the function.
- Domain and Range
- Vertical and horizontal asymptotes.
- Extreme values and inflection points.
- Intervals of increase/decrease.
- Intervals of concavity.

Keep all the computations on this page



**Problem 2** (10 pts). Verify that the function  $f(x) = x^3 - x^2 - 12x + 4$  satisfies the three hypotheses of Rolle's Theorem on the interval  $[0, 4]$ . Find all numbers  $c$  that satisfy the conclusion of Rolle's Theorem.

---

**Problem 3** (10). If  $f(1) = 7$  and  $f'(x) \geq 3$  for  $1 \leq x \leq 6$ , how small can  $f(6)$  possibly be?

--

**Problem 4** (10 pts). Find the critical values of the function  $h(x) = \frac{x-2}{x^2+1}$ . You **do not** have to indicate whether they are local maxima, local minima, or neither.

---

**Problem 5** (10pts). Find the absolute maximum and absolute minimum **values** of the function  $f(x) = 2x^3 - 6x^2 - 48x + 5$  on the interval  $[-3, 5]$ .

**Problem 6.** Compute the following limits:

$$(5\text{pts}) \lim_{x \rightarrow \infty} \frac{1}{5x + 7}$$

$$(5\text{pts}) \lim_{x \rightarrow \infty} \frac{1 - x - x^2}{5x^2 - 9}$$

$$(10\text{pts}) \lim_{x \rightarrow \infty} \left(1 - \frac{3}{x}\right)^{4x}$$

$$(10\text{pts}) \lim_{x \rightarrow \infty} x^{1/x}$$