

NAME: _____

NO SCRATCH PAPER – TIME LIMIT **ONE HOUR**¹

The point value of each problem is in the left-hand margin. You must show your work to receive any credit for your answers, except on problems 1&2. Work neatly.

(10) 1. True or False.

- () (a) The domain of the function $f(x) = \log x$ is the interval $(1, \infty)$.
- () (b) $\log 2 + \log 3 = \log(2 + 3)$.
- () (c) If $x < 0$, then $|x| = -x$.
- () (d) The graph of the function $g(x) = (x - 1)^3$ is the graph of the function $f(x) = x^3$ shifted to the right by one unit.
- () (e) The graph of the function $y = \frac{x(x-1)}{x}$ is a straight line with no holes.

(10) 2. Fill in the blanks.

- (a) As $x \rightarrow -\infty$, $f(x) = x^3 + 2x - 1 \rightarrow$.
- (b) The domain of the function $f(x) = \frac{1}{\sqrt{x+3}}$ is (,).
- (c) If f is a one-to-one function with $f(-3) = 5$ and $f(\frac{1}{5}) = -3$, then $f^{-1}(5) =$.
- (d) The graph of the function $y = 4x^5 - 3x^2 + 1$ has at most turning points.
- (e) If functions $f(x)$ and $g(x)$ are inverses of one another, then $f(g(x)) =$ for all x in the domain of g .

(5) 3. Find all asymptotes (vertical, horizontal or oblique) of the graph of the rational function $f(x) = \frac{x^3+1}{x^2-2x}$.

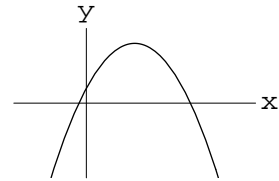
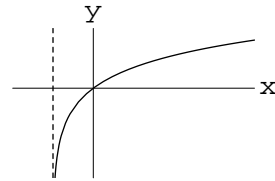
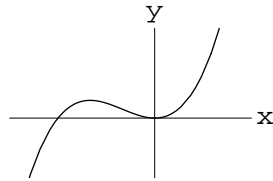
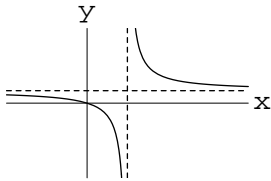
¹If you exceed the time limit you will receive a grade of zero. However, you are allotted an extra 5 minutes for checking in and out.

(12) 4. The graph of four of the following functions are shown below. Find the function corresponding to each graph. To receive partial credit, state your reasons.

(a) $y = \frac{x^2}{x^2-1}$ (b) $y = x(x+2)(x-1)$ (c) $y = 3x - 5$ (d) $y = x^2(x+2)$

(e) $y = \sqrt{x+1}$ (f) $y = \frac{x}{x-1}$ (g) $y = 3(x-1)^2 + 2$ (h) $y = \text{int}(x) = \llbracket x \rrbracket$

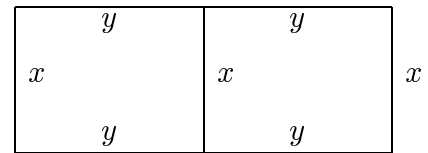
(i) $y = e^x - 1$ (j) $y = -3x^2 + 6x + 1$ (k) $y = \ln(x+1)$ (l) $y = \frac{x^2}{x-1}$



Graph of _____ ; Graph of _____ ; Graph of _____ ; Graph of _____

(13) 5. Find the x - and y -intercepts of the graph of the function $f(x) = \frac{1}{2}(x+1)^2(x-2)(x+3)$. Determine its (tail-) end behavior. Use these information with at least 7 points to graph it.

- (10) 6. A rancher has 180 yards of fencing with which to construct a rectangular double corral as shown. What outside dimensions should be used to have the entire area as large as possible?



- (8) 7. A culture of bacteria starts out with 15,000 bacteria and the population doubles in size in every five hour period. The population size after t hours is given by $P(t) = 15000(2^{\frac{t}{5}})$. How long will it take the population size to be 240,000?

- (7) 8. Given $\log_b 2 = 0.61$, $\log_b 3 = 0.96$ and $\log_b 5 = 1.41$. Find the *exact* value of $\log_b \frac{45}{8}$.

(15) 9. Solve the following equation and inequality algebraically.

(a) $\log_2(x + 1) + \log_2(x - 1) = 3$

(b) $(x - 3)(x - 1)(x + 1) \leq 0$ State the answer in interval notation.

(10) 10. Find the inverse of the 1-1 function $f(x) = \frac{1}{x-1}$.