

Please follow directions carefully and show all your work. Show your work and write your answers on the lined paper or graph paper, not on this sheet. Put your name on each page that you use. There is a total of 40 points on the exam.

Part I. (35 points) You may not use a graphing calculator on this part of the exam.

(2) 1. Consider the polynomial function $P(x) = -8x^5 + 14x^4 + 22x^3 - 57x^2 + 35x - 6$. Draw the basic shape of the graph of P , simply showing the appropriate number of increasing or decreasing sections and what the behavior of the function is as $x \rightarrow \infty$ and $x \rightarrow -\infty$. You do not need to plot intercepts or any other specific points.

(4) 2. Let $f(x) = (x - 1)^2(2x + 5) = 2x^3 + x^2 - 8x + 5$.

(a) Find the y -intercept. Write it as an ordered pair.

(b) Find the x -intercept(s). Write each as an ordered pair.

(c) Sketch the graph. Be sure to mark a scale on each axis.

(8) 3. Let $f(x) = \frac{3(x-1)(x+2)}{(x+1)^2} = \frac{3x^2+3x-6}{x^2+2x+1}$.

(a) Find the y -intercept. Write it as an ordered pair.

(b) Find the x -intercept(s). Write each as an ordered pair.

(c) Find the vertical asymptote(s), if any. Write each as the equation of a line.

(d) For each vertical asymptote $x = c$, complete the following statements:

As $x \rightarrow c^-$, $y \rightarrow$

As $x \rightarrow c^+$, $y \rightarrow$

(e) Find the horizontal asymptote(s), if any. Write each as the equation of a line.

(f) Sketch the graph. Be sure to mark a scale on each axis.

(6) 4. Carefully graph each of the following functions (on separate coordinate planes). Be sure to label at least two specific points on each graph.

(a) $y = 4^x$

(b) $y = -4^{x+2}$

(c) $y = \log_4 x$

(4) 5. Evaluate each of the following.

(a) $\log \frac{1}{100}$

(b) $\ln e$

(c) $7^{3\log_7 5}$

(1) 6. Approximately how large is the number $\log_2 50$?

- (i) between 0 and 1 (ii) between 1 and 2 (iii) between 2 and 3
(iv) between 3 and 4 (v) between 4 and 5 (vi) between 5 and 6
(vii) between 6 and 7 (viii) between 7 and 8

(1) 7. Write in logarithmic form: $s^t = w$

(3) 8. Write as a single logarithm of a single number: $\log_a 16 + \frac{1}{2}\log_a 9 - \log_a 8$

(6) 9. Answer each of the following true (T) or false (F).

(a) A polynomial function never has a vertical asymptote.

(b) Every rational function is continuous.

(c) A graph can never cross one of its asymptotes.

(d) The function $y = 4^x$ grows faster than the function $y = x^4$.

(e) The function $y = \log_4 x$ grows faster than the function $y = x^4$.

(f) You can take the logarithm of a positive number only.

Part II. (5 points) You may use a graphing calculator on this part of the exam.

(3) 10. Suppose \$2000 is invested at 7.5% annual interest compounded continuously. How much money (to the nearest cent) will the investment be worth after five years?

(2) 11. Evaluate $\log_6 23$.