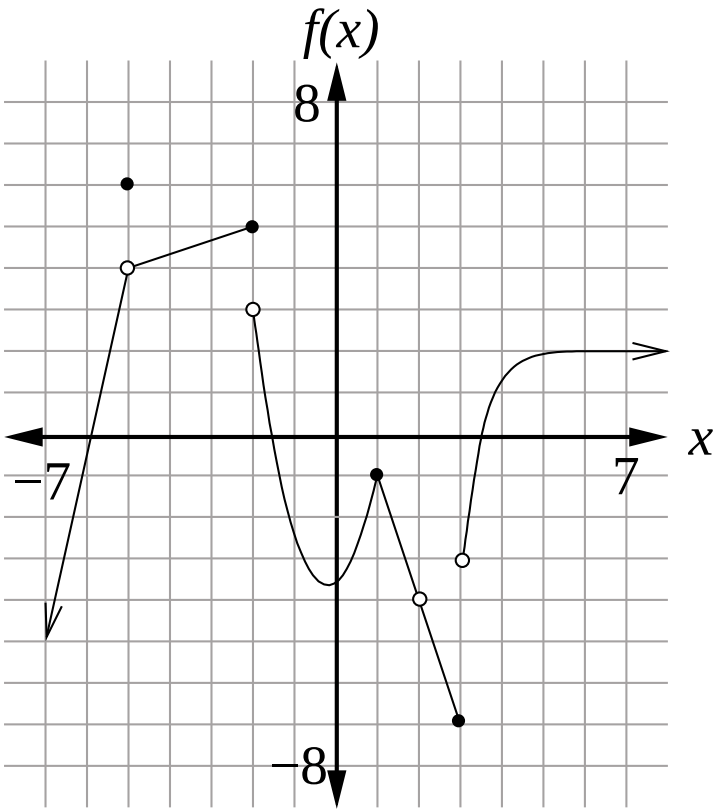
Math 142 - Exam 1 Review

NOTE: Exam 1 covers sections 1.2, 1.3, 2.1-2.5, Regression, and 3.1-3.3. This review is intended to highlight the material covered on Exam 1 but should not be used as your sole source of practice. Also refer to your instructor's lecture notes, previous week-in-reviews, suggested homework, supplemental homework, and the online homework as additional sources for review and exam preparation.

1. Use the graph of $f(x)$ below to answer each of the following.



(a) $\lim_{x\to 2} f(x)$

(b) $\lim_{x\to -2^+} f(x)$

(c) $\lim_{x\to 3} f(x)$

(d) $f(-5)$

(e) $\lim_{x\to \infty} f(x)$

(f) $\lim_{x\to -\infty} f(x)$

(g) Find all points of discontinuity of $f(x)$.

(h) Find all intervals over which $f(x)$ is continuous.

(i) Find the domain and range of $f(x)$.

2. Find each of the following.

(a) $\lim_{x\to -4} \dfrac{2x+8}{x^2-3x-28}$

(b) $\lim_{x\to 10} f(x)$ where $f(x) = \begin{cases} 2x-5 & \text{if } x<10 \\ k & \text{if } x=10 \\ \frac{x^2-9x+5}{x-7} & \text{if } x>10 \end{cases}$

(c) Find all values of k for which $f(x)$ is continuous at $x=10$. If this is not possible, explain why.

3. Determine the intervals where the following functions are continuous.

(a) $f(x) = \log_5(x-7)$

(b) $g(x) = \dfrac{\sqrt[6]{x-4}}{x^2-8x+12}$

4. Find the domain of each of the following functions.

(a) $f(x) = \dfrac{\log_2(x-5)}{e^{2x}-3}$

(b) $g(x) = \begin{cases} \frac{1}{\ln(x-3)} & \text{if } 3 \le x < 5 \\ \frac{1}{\sqrt[3]{4x-24}} & \text{if } x \ge 5 \end{cases}$

5. Evaluate each of the following.

(a) $\lim\limits_{x\to\infty} \dfrac{2x^2-4x^3+7}{9+4x+7x^3}$

(b) $\lim\limits_{x\to-\infty} \dfrac{5x-2}{3x-4x^2+3}$

(c) $\lim\limits_{x\to-\infty} \dfrac{2x+6x^2+1}{2-3x}$

6. Find all asymptotes, x-coordinates of any holes, and intercepts of each of the following.

(a) $f(x) = \dfrac{4x^2 + 17x - 42}{x^2 + 4x - 12}$

(b) $f(x) = \dfrac{8x - 16}{x^4 - 6x^3 + 8x^2}$

7. Acme Clothing produces game day wear for Aggie alumni. They can produce 31 polo style shirts for a total cost of $416 and 86 polo style shirts for a total cost of $636. They also know that when 100 shirts are demanded they can sell each shirt for $3, and when 30 shirts are demanded they can sell each shirt for $17.70. (courtesy Jenn Whitfield)

   (a) How many shirts must Acme Clothing produce and sell to break even? (Assume the demand and cost functions are linear.)

   (b) If Acme's production of polo style shirts decreases by 15 shirts, what is the corresponding change in Acme's total cost?

   (c) How many shirts must be produced for the company to reach their maximum profit?

   (d) At what price does the company need to sell their shirts to obtain maximum profit?

8. What sequence of graph transformations must be performed to obtain the graph of $g(x) = -5f(x+7) - 9$ from the graph of $f(x)$?

9. The following table shows the resale value of a particular model car as a function of mileage (how many miles the car has been driven).

Mileage (thousands of miles)	10	30	50	70	100	120
Resale Value (dollars)	13,700	10,200	7,900	6,500	5,000	4,300

Using either a linear, quadratic, or exponential model, find the best fitting regression model if used to predict the value of the car when the odometer reads

(a) 20,000 miles.

(b) 160,000 miles.

10. Bob invested an inheritance of $5,000 in an account paying 4.25% per year compounded semiannually, and 7 years later, he transferred the balance of this account into a new account paying 5.2% per year compounded continuously.

(a) Write a piecewise-defined function that gives the value of Bob's inheritance after t years.

(b) How much will Bob's inheritance be worth 10 years after the original investment?

(c) How long will it take for Bob's investment to reach a value of $6,000?

11. Find the domain, range, intercepts, and vertex of $p(x) = -5x^2 + 270x + 7$.

12. Solve each of the following for x, y, or b as indicated. Give exact answers.

(a) $\log_2\left(\log\left(x^2 - 3x\right)\right) = 0$

(b) $\dfrac{9^{7x}}{81^3} = 27^{4x}$

(c) $\log_{\frac{1}{4}} 16 = y$

(d) $3\log x = \log\left(15x^2 - 10x\right) - \log 5$

(e) $2 \cdot 7^x - 5 = 13$

13. Describe the end behavior of each of the following.

(a) $p(x) = 3x - 7x^2 + 2x^3 - 5$

(b) $g(x) = 5 - 7x + 6x^2 - 7x^4$

14. If $\log x = 7$, $\log y = 4$, and $\log z = -2$, find $\log \dfrac{x^2}{yz^4}$.

15. Find the limit as h approaches 0 of the difference quotient for $f(x) = 2 - 7x^2$ at $x = -1$.