MTH 126
Exam 2
Spring 2025

Formulas are on the last page, which you may pull off.

Calculators are allowed. You may use a scientific calculator or a graphing calculator (e.g., TI-84) but not one with CAS (e.g., no TI-89, no TI-Nspire CAS). You may not use a phone app.

Show work to support each answer, to be eligible for full credit. Be neat and organized. Clearly indicate your answers.

100 points possible. 10 problems at 10 points each.

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1. What is the future value if \$19,745 is invested for 16 years at 14% compounded semiannually?

2. Let $m = 4$, $t = 12$, $r = 0.09$, and $R = 7500$

Reminders: Don't round $s_{\overline{n}|i}$, v, or $a_{\overline{n}|i}$. Round S and A_n to 2 decimal places.

(a) Find $S = R \cdot s_{\overline{n}|i}$

(b) Find v and $A_n = R \cdot a_{\overline{n}|i}$

3. Suppose you deposit \$180 at the end of each quarter into an account that pays 8% interest, compounded quarterly. How much money will you have in your account in 9 years?

4. What lump sum do you have to invest now in order to be able to withdraw \$200 at the end of each month for the next 18 years? Suppose the interest rate is 9%, compounded monthly.

5. A loan of \$24,000 is to be amortized by equal payments at the end of each year for 3 years. The interest rate is 16%, compounded annually.

▷ *The annual payment is* \$10,686.19

Use this annual payment. You don't have to verify that it's correct.

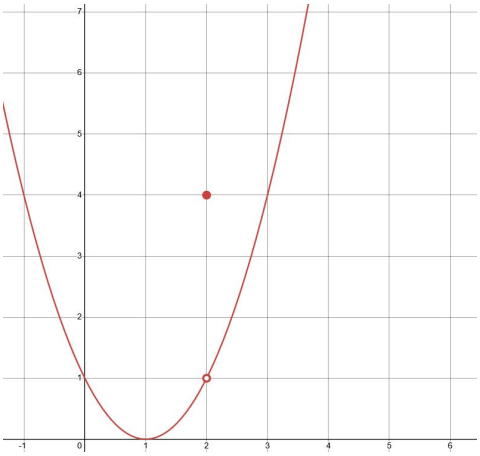
(I will only grade the rows for Period 1 and Period 2. You can leave Period 3 blank or try doing it to check your work. I won't grade Period 3.)

Construct the amortization schedule.

Period	*Payment*	*Interest Paid*	*Principal Repaid*	*Unpaid Balance*
				24,000.00
1				
2				
3				

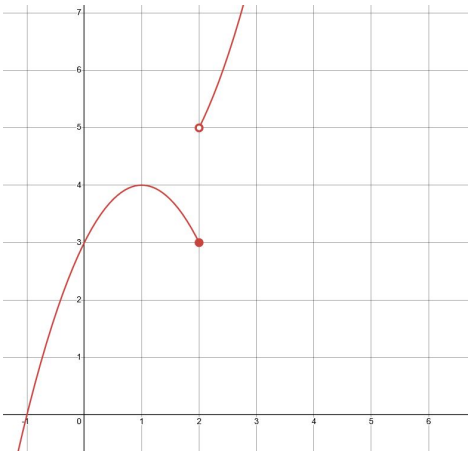
6. In each part, a graph of $y = f(x)$ is shown and a c-value is given. Use the graph to find the indicated quantities, whenever they exist. (If a limit is infinite, say "∞" or "$-\infty$" as appropriate. If a limit does not otherwise exist, say DNE.)

(a) $c = 2$



(i) $\lim_{x \to c} f(x)$ (ii) $f(c)$

(b) $c = 2$



(i) $\lim_{x \to c^-} f(x)$ (ii) $\lim_{x \to c^+} f(x)$ (iii) $\lim_{x \to c} f(x)$ (iv) $f(c)$

7. Use properties of limits and algebraic methods to find the limit, if it exists. (If a limit is infinite, say "∞" or "$-\infty$" as appropriate. If a limit does not otherwise exist, say DNE.)

$$\lim_{x \to 3} \frac{x^2 - 10x + 21}{x^2 - 9}$$

8. We are given $f(x) = 135x - 4x^2$ and $f'(x) = 135 - 8x$.

(a) Find the instantaneous rate of change of $f(x)$ at $x = 7$.

(b) Find the slope of the tangent to the graph of $f(x)$ at $x = 7$.

(c) Find the point (x, y) on the graph of $f(x)$ at $x = 7$.

9. Let $f(x) = 4x^2 + 10x$. This problem asks you to find $f'(x)$ by using the definition of derivative. The five steps are outlined for you. For parts (a) through (e), simplify the given expression.

(a) $f(x+h) =$

(b) $f(x) =$

(c) $f(x+h) - f(x) =$

(d) $\dfrac{f(x+h) - f(x)}{h} =$

(e) $f'(x) = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h} =$

10. Find the derivative of the function.

(a) $f(x) = 12x^8 - 9x^{11}$

(b) $g(x) = 7x^{-5} - 3x^{-6}$

(c) $h(x) = \dfrac{9}{x^5} + 8\sqrt{x}$