

MAT 145: Test #2 (Part II: 30 points)

Part 2: Calculator OK!

Name _____ Calculator Used _____ Score _____

A particle moves along the x axis of a coordinate plane so that its position in relation to the origin, in **feet**, at time t is $s(t) = 2t^3 - \frac{7}{2}t^2 - 5t + 2$, t in **minutes**, t **any real number**. Use this information for questions 14–18.

Please carefully check the units of measure included with your responses! (14-16: 3 pts each; 17 and 18: 4 pts each)

14. Calculate the **velocity function**, $v(t)$, at time t minutes. Include units. _____

15. Calculate the **acceleration function**, $a(t)$, at time t minutes. Include units. _____

16. Calculate the **instantaneous rate of change** of the particle's position at time $t = 1$ minute. Include units. _____

17. Sarah stated that the particle was **moving to the right** at precisely the time $t = 1$ minute.

(a) Is Sarah correct? (2 pts) YES NO (Circle one.)

(b) Explain and justify your response using **calculus-based evidence**. (2 pts)

18. At $t = 1$ minute: (a) Describe the particle's behavior with respect to whether it is **speeding up**, **slowing down**, or **neither**. (2 pts) (b) Show **calculus-based evidence (calculations)** to support your decision. Explain and justify your response so that you are **clearly connecting your evidence to your conclusions**. (2 pts)

(a) Particle behavior at $t = 1$ min (circle one): speeding up slowing down neither

(b) Explain:

Ralph swallows a prescription drug at 12 noon. The amount of drug in his blood stream can be modeled by the function $A(t) = \frac{10}{3}t - \frac{5}{54}t^3$, with A measured in **micrograms** (mcg) and t in **hours**, where $t = 0$ corresponds to 12 noon (12:00 pm). Use this information for questions 19 through 21.

19. **In this context**, what is the meaning of $A(2) = 5.52593$? Include units! (4 pts)

20. Explain the meaning of $A'(4) = -1.1111$ **for this situation**. Include units! (4 pts)

21. Graph $A(t)$ on your graphing calculator for $0 \leq t \leq 6$. In box (a), **sketch the shape of the curve** you see in your **adjusted window**, and **label the axes**. (3 pts) In box (b), circle **one best option**. (2 pts)

(a) Sketch of graph on adjusted calculator window	(b) Interpretation
	<p>As time passes, the amount of prescription medication in Ralph's bloodstream is <u> ? </u>.</p> <p>(Circle one best option.)</p> <ul style="list-style-type: none"> (i) increasing (ii) decreasing (iii) increasing then decreasing (iv) decreasing then increasing

BONUS!

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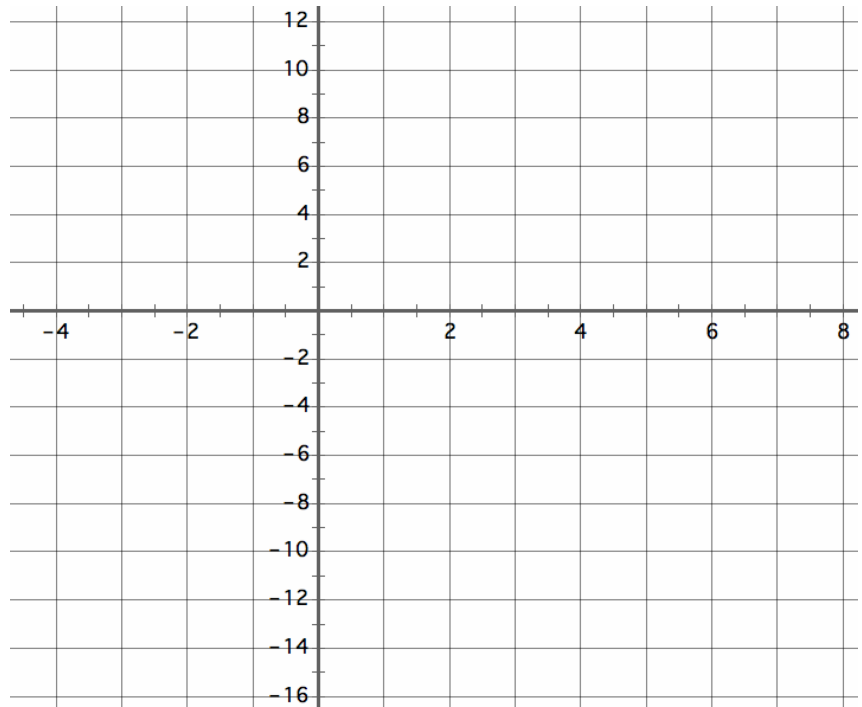
BONUS!

[I] State the **first name** and the **last name** for each of the two individuals who are credited with creating calculus more than 300 years ago. Spelling will be checked! (2 pts)

[II] Lionel graphed the parabola $g(x) = 1 + 6x - x^2$ and the point $R = (0, 5)$. He noticed that there would be two lines that contain point R that would be tangent to his parabola.

(a) On the axes here:

- (i) Sketch a graph of this parabola. (1 pt)
- (ii) Plot and label point R . (1 pt)
- (iii) Sketch the two tangent lines. (1 pt)



(b) Determine an equation for each of the tangent lines described here. Write each equation in the form $y = mx + b$. Include appropriate evidence to justify your equations. Clearly distinguish which equation goes with which tangent line in your sketch. (3 pts)

Calculus I
MAT 145
Test #2: 50 points

Evaluation Criteria

Part I: No Calculators (20 points)

(1)–(10): 1 pt each (no partial credit)

(11)–(12) 3 pts each: correct and complete algebraic evidence showing determination of derivative; correct format as described

(13) 4 pts: correct and complete algebraic evidence showing determination of derivative; correct format as described

Part II: Calculators May Be Used (30 points)

(14)–(15) 3 pts each: correct functions with appropriate units

(16) 3 pts: correct response with appropriate units

(17) 4 pts: (a) 2 pts: correct yes/no response; (b) 2 pts: appropriate calculus-based justification

(18) 4 pts: (a) 2 pts: correct yes/no response; (b) 2 pts: appropriate calculus-based justification

(19) 4 pts: Correct interpretation with correct units

(20) 4 pts: Correct interpretation with correct units

(21) 5 pts: (a) 2 pts: Correct representation of the curve from adjusted calculator window; 1 pt: correct axes labels; (b) 2 pts: correct and appropriate interpretation of the situation that corresponds to the behavior of the function, on the indicated interval.

BONUS: Calculators May Be Used (no penalty, 8 points)

Bonus (I) 2 pts: correct names with correct spelling

Bonus (II) 6 pts: (a) 3 pts: (1 pt each, (i) through (iii), showing correct graph with all components, appropriately labeled) (b) 3 pts: Correct equations, clearly identified to match part (a) and supporting evidence for determining equations.