

PRINT NAME

Excellence
Bonus

1

No calculators

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Score

66

Put answers in the boxes provided on this page. **Show high quality work** in your blue book for **all answers**. Points may be awarded for this. **Number your solutions** in the blue book.

At the end of the exam, place this page INSIDE your blue book.

TA: ☐ Garo

☐ Sam

☐ Trevor

Section Time: ☐ 8am

☐ 6pm

☐ 5pm

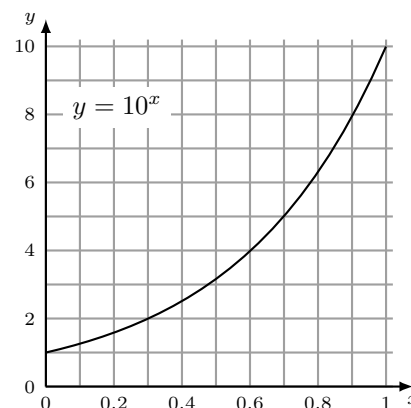
☐ 7pm

1. [/6] Use the graph given to find the following as decimal numbers.

(a) Solve $10^{4x} = 210$

(b) Find 1.5^{10}

(c) Find a value c so that the average rate of change of 10^x between $x = 0$ and $x = c$ is 5



2. [/6] Let $f(x) = 3x^5 + 2x^3 - 4x$. Find

(a) $f'(x)$

(b) $\frac{d^2 f}{dx^2}$

(c) $f''(1) + 2f'(0)$

4. [/6] Let $y = 2x^2 - 11x + 2$.

(a) What is the value of x at which the slope of the graph is 1?

$x =$

(b) What value of x produces the minimum of this function?

$x =$

(c) Write the equation $y = mx + b$ of the tangent line to the graph at $x = 3$.

$y =$

3. [/6] In this question k is a constant. Calculate

(a) $\frac{d}{dx} (x^k - 5e^{2kx})$

(b) $\frac{d}{dx} ((2x + k)(2x - k))$

(c) $\frac{d}{dx} ((2x^k + 5)/x^2)$

5. [/8] Marie stands on a cliff on the Ellwood Mesa, overlooking the Pacific ocean. She throws a Frisbee flying disc into the air. After t seconds, the height of the Frisbee **above the cliff** is $30t - 2t^2$ meters. The disc lands in the ocean after 30 seconds.

(a) What was the speed of the Frisbee when it hit the ocean?

m/sec

(b) What was the velocity of the Frisbee after 3 seconds?

m/sec

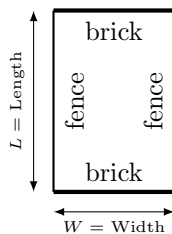
(c) How high above the ocean is the cliff?

meters

(d) How high did the Frisbee go **above the cliff**?

meters

6. [/8] A rectangular field has fences along two parallel sides and brick walls along the other two parallel sides. Fence costs \$10 per meter and brick costs \$30 per meter.



- (a) Express the total cost of the fence and brick in terms of the length L and width W of the field.

- (b) The area of the field will be 300 square meters. Express the **length** of the field in terms of the width of the field.

- (c) Use this to express the total cost of brick and fence in terms of the width of the field.

- (d) What should the width of the field be so that the cost is smallest?

[you can leave a square root in your answer]

9. [/6] Initially Jason is in Sacramento and Marie is in Isla Vista. The road between them is 620 km long. Marie starts driving at noon, driving a constant speed M . Jason starts an hour later, at 1pm. He drives at speed J for the first hour, then increases his speed to $2J$. They meet at 4pm. At 3pm they are 200 km apart.

- (a) Write two equations that express these facts.

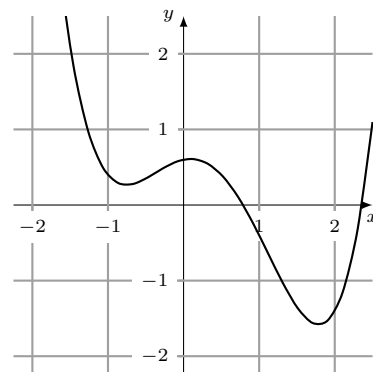
- (b) What was **Marie's** speed?

 km/hr

7. [/6]

- (a) For which value(s) of x is

$$f'(x) = 0?$$



- (b) For which values of x is $f''(x) < 0$?

- (c) Find a single value of x with $f'(x) = -2$.

8. [/6] Let $f(x) = 2e^{3x} - 5x$.

- (a) Find $f'(0)$.

- (b) Find the equation of the tangent line $y = mx + b$ to $y = f(x)$ at $x = 0$.

- (c) Use this to approximate the value of $f(-0.1)$.

10. [/8] Bob's House of Index Cards sells note cards for exams. If the price is 5 cents, he sells 350 cards. For each cent he increases the price, he sells 10 fewer cards.

- (a) If he sells each card for $(5 + x)$ cents, how many are sold?

- (b) What is the total amount of money Bob gets by selling cards for $5 + x$ cents each. **Simplify your answer.**

- (c) What price for the card gives Bob the most money? [Your answer may involve half cents]

- (d) How many cards does he sell to make the most money?