



Calculus 1 Final Exam

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MATH

Calculus 1 Final Exam

This exam is comprehensive over the entire course and includes 12 questions. You have 60 minutes to complete the exam.

The exam is worth 100 points. The 8 multiple choice questions are worth 5 points each (40 points total) and the 4 free response questions are worth 15 points each (60 points total).

Mark your multiple choice answers on this cover page. For the free response questions, show your work and make sure to circle your final answer.

1. (5 pts)	<div>A</div>	<div>B</div>	<div>C</div>	<div>D</div>	<div>E</div>
2. (5 pts)	<div>A</div>	<div>B</div>	<div>C</div>	<div>D</div>	<div>E</div>
3. (5 pts)	<div>A</div>	<div>B</div>	<div>C</div>	<div>D</div>	<div>E</div>
4. (5 pts)	<div>A</div>	<div>B</div>	<div>C</div>	<div>D</div>	<div>E</div>
5. (5 pts)	<div>A</div>	<div>B</div>	<div>C</div>	<div>D</div>	<div>E</div>
6. (5 pts)	<div>A</div>	<div>B</div>	<div>C</div>	<div>D</div>	<div>E</div>
7. (5 pts)	<div>A</div>	<div>B</div>	<div>C</div>	<div>D</div>	<div>E</div>
8. (5 pts)	<div>A</div>	<div>B</div>	<div>C</div>	<div>D</div>	<div>E</div>



1. (5 pts) A ball is thrown straight up from the ground with an initial velocity of $v_0 = 32$ ft/s. What is the ball's maximum height?

☐ A 16 ft

☐ C 36 ft

☐ E 72 ft

☐ B 32 ft

☐ D 48 ft

2. (5 pts) Find the points of discontinuity of the function.

$$f(x) = \begin{cases} x + 3 & x \leq -3 \\ \frac{1}{x} & -3 < x < 3 \\ \sqrt{x - 3} & x > 3 \end{cases}$$

☐ A $x = 3$

☐ C $x = -3$

☐ E $x = -3, 0, 3$

☐ B $x = 0, 3$

☐ D $x = -3, 3$



3. (5 pts) Does the polynomial function $x^3 - 5x + 3$ have a zero in the interval $[-5,5]$?

- ☐ **A** Yes, there is one zero in the interval $[-5,5]$.
- ☐ **B** Yes, there are 3 zeros in the interval $[-5,5]$.
- ☐ **C** No, there are no zeros in the interval $[-5,5]$.
- ☐ **D** No, the function does not have any zeros.
- ☐ **E** Cannot be determined

4. (5 pts) Apply power rule and chain rule to find the derivative.

$$f(x) = 7(5x^2 - 3)^4$$

- ☐ **A** $f'(x) = 10x(5x^2 - 3)^3$
- ☐ **B** $f'(x) = 28x(5x^2 - 3)^2$
- ☐ **C** $f'(x) = 28x(5x^2 + 3)^3$
- ☐ **D** $f'(x) = 280x(5x^2 - 3)^3$
- ☐ **E** $f'(x) = 280x(5x^2 + 3)^2$



5. (5 pts) Evaluate the limit.

$$\lim_{x \rightarrow 3} \frac{x + 6}{x}$$

- | | | | |
|----------------------------|--------------------------|----------------------------|---|
| <input type="checkbox"/> A | The limit does not exist | <input type="checkbox"/> D | 0 |
| <input type="checkbox"/> B | -3 | <input type="checkbox"/> E | 1 |
| <input type="checkbox"/> C | 3 | | |

6. (5 pts) Use the Second Derivative Test to classify the critical points at $x = 0$ and $x = 10/9$ for the function $f(x) = -6x^3 + 10x^2$.

- ☐ A Relative minimum at $x = 0$; Relative maximum at $x = 10/9$
- ☐ B Relative minimum at $x = 10/9$; Relative maximum at $x = 0$
- ☐ C Relative minima at $x = 0$ and $x = 10/9$
- ☐ D Relative maxima at $x = 0$ and $x = 10/9$
- ☐ E There are no relative maxima or minima



7. (5 pts) Evaluate the limit of the composite function when $f(x) = 5x^3$ and $g(x) = 2x - 3$.

$$\lim_{x \rightarrow 4} f[g(x)]$$

☐ A -5

☐ C 25

☐ E 625

☐ B 5

☐ D 125

8. (5 pts) An item is currently selling for \$120/unit. The quantity supplied is decreasing by 24 units/week. At what rate is the price of the item changing, given $q = 4,000e^{-0.01p}$?

☐ A \$1.99

☐ C \$2.80

☐ E \$1.26

☐ B \$4.25

☐ D \$5.53



9. (15 pts) Graph $f(x) = 2x^4 - 3x^2$. Your work must include the intervals on which $f(x)$ is increasing and decreasing, any local extrema, the intervals on which $f(x)$ is concave up and concave down, and any points of inflection. Your sketch should clearly reflect this information.

10. (15 pts) Find the derivative of the function.

$$f(x) = 4x^3 \left(\frac{1}{x} + 3 \right)$$



11. (15 pts) A 15-foot ladder is sliding down a vertical wall while its bottom slides away from the wall at 10 ft/s. How fast is the top moving when the top is 6 feet off the ground?

12. (15 pts) You want to construct a box with a square bottom and you only have 36 m^2 of material. Assuming you use all of the material, what is the maximum volume of the box?

