Calculus 1
Final Exam

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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)   A   B   C   D   E

2. (5 pts)   A   B   C   D   E

3. (5 pts)   A   B   C   D   E

4. (5 pts)   A   B   C   D   E

5. (5 pts)   A   B   C   D   E

6. (5 pts)   A   B   C   D   E

7. (5 pts)   A   B   C   D   E

8. (5 pts)   A   B   C   D   E

1. (5 pts) Find the derivative of $f(x) = \sqrt{14 - 2x}$.

A $\quad -\dfrac{1}{\sqrt{14 - 2x}}$

C $\quad \dfrac{x}{\sqrt{14 - 2x}}$

E $\quad \dfrac{1}{\sqrt{14 - 2x}}$

B $\quad -\dfrac{1}{\sqrt{x}}$

D $\quad -\dfrac{1}{\sqrt{7 - x}}$

2. (5 pts) Find any point discontinuities of the function.

$$f(x) = \dfrac{x^2 + 7x + 10}{x^2 - 3x - 10}$$

A $\quad x = 1$

C $\quad x = 2$

E $\quad x = -2$

B $\quad x = -5$

D $\quad x = 5$

3. (5 pts) What statement is being made by the limit equation?

$$\lim_{x \to 4} x^2 + 1 = 17$$

| A | The limit as x approaches 17 of the function $f(x) = x^2 + 1$ is 4. |

| B | The limit as x approaches 4 of the function $f(x) = x^2 + 1$ is 17. |

| C | The limit as x approaches 4 of the function $f(x) = x^2$ is 17. |

| D | The limit as x approaches 4 of the function $f(x) = x^2 + 1$ is not 17. |

| E | The limit as x approaches 17 of the function $f(x) = x^2 + 1$ is not 4. |

4. (5 pts) Evaluate the limit of the composite function when $f(x) = 2x^3$ and $g(x) = 2x + 3$.

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

| A | 1,331 | C | 2,662 | E | 128 |

| B | 11 | D | 259 |

5. (5 pts) Uranium-232 has a half-life of 68.9 years. Find the decay constant.

A   0.0101

B   0.1011

C   0.0111

D   0.0011

E   0.0001

6. (5 pts) If $f(x) = x^2 + 4x + 3$ and $g(x) = 2x - 1$, evaluate the limit.

$$\lim_{x \to -1} \frac{f(x)}{4g(x)}$$

A   The limit does not exist

B ∞

C $-\infty$

D   0

E   1

7. (5 pts) A local sandwich shop has a weekly revenue given by $R(x) = -0.4x^2 + 500x$, where x represents a sandwich. How many sandwiches need to be sold to maximize weekly revenue?

A   150

B   500

C   625

D   750

E   1,250

8. (5 pts) The function $T(t) = 6e^{-t}$ models the temperature (in Celsius) of a cooling object. What is the approximate temperature of the object after 1 hour?

A $6°\ C$

B $4°\ C$

C $3°\ C$

D $2°\ C$

E $0°\ C$

9. (15 pts) Air is being pumped into a spherical ball at a rate of 3 cm^3/s. How fast is the length of the radius increasing when $r = 9$ cm?

10. (15 pts) You made an initial investment of $\$1{,}500$ at an annual interest rate of 4.8%, compounded continuously. If the investment is currently worth $\$6{,}430$, how many years have you had the investment?

11. (15 pts) A water balloon is dropped from the top of a building and falls 7 m to the ground. Given the position function of the water balloon, find instantaneous velocity at $t = 2$ seconds.

$s(t) = -8t^2 + 4t - 7$

12. (15 pts) Find the equation of the normal line to the function at $(2,4)$.

$f(x) = \dfrac{4x^3}{x + 5}$