

UNIT TEST **Lessons 15-21** (100 points possible)



I. $f(x) = 3x^4 - 4x^3 - 12x^2 + 3$ (4 points per section)

1. Find all critical points.

2. Where is $f(x)$ increasing and decreasing?

3. Find all x values for the maximum and minimum values of $f(x)$.

4. Find all x values for possible inflection points for $f(x)$.

5. Which shape best describes $f(x) = 3x^4 - 4x^3 - 12x^2 + 3$?



II. Two truck drivers begin their respective trips at the same time originating at the same truck stop. Tom drives due north and Sam drives due west. When Tom is .6 miles north, he is traveling at 20 mph and simultaneously Sam is .8 miles west and is traveling at 25 mph. At that instant, how fast are the two trucks separating? (20 points possible)

III. Find two real numbers whose sum is 10 that have the largest product possible.
(12 pts possible)

IV. A computer game manufacturer determines that in order to sell x units of a new computer game system, the price per unit must be $p = 50 - .01x$. The manufacturer also determined that the total cost for producing x units would be $C(x) = 1000 + 39x$. (4 points per section)

1. Find the total revenue, $R(x)$.

2. Find the total profit, $P(x)$.
3. How many computer games must be sold to maximize profit?
4. Find the break-even points.
5. What is the maximum profit?
6. What is the marginal cost?
7. What price per unit must be charged in order to make the maximum profit?

V. The height of a ball above the ground is $d(t) = 60t - 5t^2 + 18$. (4 points per section)

$d(t)$ = the height measured in meters and t = time measured in seconds.

1. How high was the ball initially?
2. Find the velocity formula.
3. Find the acceleration formula.
4. When did the ball reach its peak?
5. How high did the ball go?