Quiz #3 Study Guide

- **Lesson 24- Power Rule**

  - Example: $f(x)=x^3+3x^2+3$

Bring down the power and subtract one, remember to use correct notation ($f'(x)$ or dy/dx, etc.

Answer: $f'(x)= 3x^2+6x$

- **Lesson 27- Tangent Lines and Higher Order Derivatives**

  - Given a function f(x) that is differentiable then the equation to the line tangent at x=a is $y= f'(a)(x-a)+f(a)$
    - ➔ Slope = The derivative of f(x) at a so $f'(a)$
    - ➔ Point= (a, f(a))

  -Example: Find The equation of the line tangent to the graph of $f(x)=3x^3+x^2+2x$ when x=4

  First find the slope

  $f'(x)= 9x^2+2x+2$ $f'(4)= 154$

  Next find the point

  $f(4)= 3(4)^3+(4)^2+2(4)= 216$

  Answer: $y= 154(x-4)+216$

  - Second Derivatives

    Take the derivative of the first derivative

  -Example: Find the second derivative for $f(x)=x^3+3x^2+3$

  $f'(x)= 3x^2+6x$

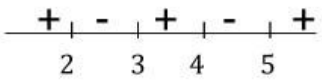
  Answer: $f''(x)= 6x+6$

- **Lesson 28- Graphs of Rational Functions**

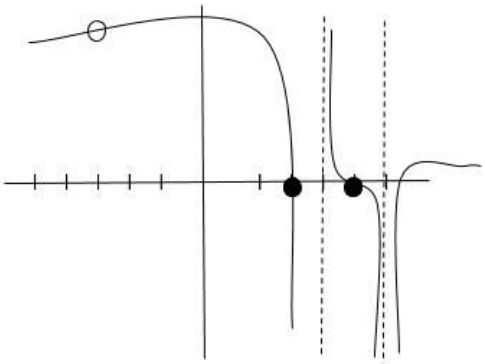
  - If $R(x)= \frac{k(x-r)(x-r2)...(x-rn)}{k(x-q)(x-q2)...(x-qm)}$
    - ➔ Zeros of R(x) are the zeros of the numerator
    - ➔ Vertical Asymptotes (VA) are zeros of the denominator
    - ➔ Hole is when a zero appear is both the numerator and denominator

  -Example: Graph by hand $R(x)= \frac{(x-4)(x+3)(x+2)}{(x+3)(x-5)(x-3)}$

1.) Holes? x= -3
2.) VA's? x= 5, 3
3.) Zero's? x= 4, 2
4.) Sign Chart (consists of both zeros and VAs)



To find at what point the whole is plug x= -3 into R(x) , R(-3)= 72
Answer:



- **Lesson 29 and 31- Differentials and Product Rule**

f(x)	↑ / ↓	↗ / ↷
f'(x)	+/-	↑ / ↓
f''(x)		+/-

- Product Rule

$$\frac{d}{dx}(f(x) \cdot g(x)) = (f'(x) \cdot g(x)) + (g'(x) \cdot f(x))$$

-Example: $f(x)= 3xy^3+2x+4y+x^2y$ find the derivative

Answer: $f'(x)= 9xy^2+3y^3+2+4+2xy+x^2$

- **Lesson 32- Indefinite Integrals**

-Indefinite integrals give you a family of functions starting with the derivative of that family of functions

-Example: $\int 4x^3 \, dx = x^4 + c$

To check your answer take the derivative of your answer so

$f(x)= x^4 + c$

$f'(x)= 4x^3$

Since the derivative matches the inside of the integral we know that our answer is correct

- **Review Problems**

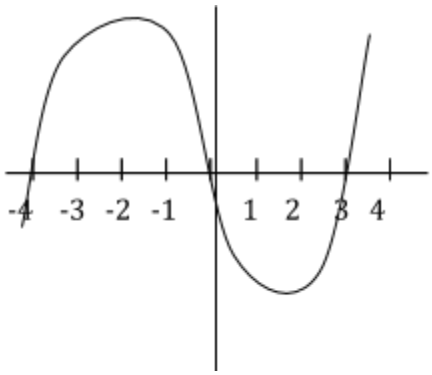
1.) Find the line tangent to $y= x^3-6x+3$ when x=4

2.) Find the first and second derivative of $f(x)= 4x^{-1/2}+3x+5$

3.) Find the derivative of $f(x)= x^3 + x^{-5/4} + \sqrt[3]{x}$

4.) If f(x) is decreasing on the interval -3<x<2 what does that mean for f'(x)?

5.) Given the graph of the derivative when is the function concave up or down?



6.) $\int 7x^6 \, dx$

7.) $\int 6e^x \, dx$