## Financial Algebra

## Summer Assignment

$\qquad$

Properties of Exponents:

1. Whole number exponents: $x^{n}=x \cdot x \cdot x \cdot \ldots \cdot x$ ( n factors of x )
2. Zero exponents: $\quad x^{0}=1, x \neq 0$
3. Negative Exponents: $\quad x^{-n}=\frac{1}{x^{n}}$
4. Radicals (principal nth root): $\sqrt[n]{x}=a \rightarrow x=a^{n}$
5. Rational exponents: $\quad x^{1 / n}=\sqrt[n]{x}$
6. Rational exponents: $\quad x^{m / n}=\sqrt[n]{x^{m}}$

Operations with Exponents:

1. M ultiplying like bases: $\quad x^{n} x^{m}=x^{m+n}$
2. Dividing like bases: $\quad \frac{x^{m}}{x^{n}}=x^{m-n}$
3. Removing parentheses:

$$
(x y)^{n}=x^{n} y^{n}
$$

$\left(\frac{x}{y}\right)^{n}=\frac{x^{n}}{y^{n}} \quad\left(x^{n}\right)^{m}=x^{n m}$
$2 a^{2} b^{-4} \cdot 4 a^{-8} b^{6}$
$\frac{8 a^{2} b^{-2}}{4 a^{4} c^{-5}}$

$$
\left(\frac{3 x^{4}}{y^{-2}}\right)^{3}
$$

## Special Products and Factorization Techniques

Quadratic Formula:

$$
a x^{2}+b x+c=0 \rightarrow x=\frac{-b \pm \sqrt{b^{2}-4 a c}}{2 a}
$$

$$
3 x^{2}-4 x-2=0
$$

$$
-5 x^{2}+6 x+4=0
$$

Special Products:

$$
\begin{aligned}
& x^{2}-a^{2}=(x-a)(x+a) \\
& x^{3}-a^{3}=(x-a)\left(x^{2}+a x+a^{2}\right) \\
& x^{3}+a^{3}=(x+a)\left(x^{2}-a x+a^{2}\right)
\end{aligned}
$$

$4 x^{2}-144$

$$
8 x^{3}-27
$$

$$
64 x^{3}+125 y^{3}
$$

$$
x^{2}-13 x+42
$$

$$
8 x^{2}-10 x-3
$$

$$
4 x^{3}+8 x^{2}-5 x-10
$$

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Lines

Slope:
$\frac{y_{2}-y_{1}}{x_{2}-x_{1}}$
Slope Intercept Form:
$y=m x+b$
Standard Form:
Point-Slope Form:
$a x+b y=c$
$y-y_{1}=m\left(\begin{array}{ll}x & x_{1}\end{array}\right)$

Transformations

$$
\begin{array}{ll}
\text { Vertical Translations: } & y=f(x) \pm k \\
\text { Horizontal Translations: } & y=f(x \pm h) \\
\text { Y-axis flip: } & y=f(-x) \\
\text { X-axis flip: } & y=-f(x) \\
\boldsymbol{f ( x ) = - \boldsymbol { x } ^ { 2 } + \mathbf { 4 }} & \boldsymbol{f}(\boldsymbol{x})=|-\boldsymbol{x}|-\mathbf{4}
\end{array}
$$

Functions
Domain: a set of all possible values for the independent variable
Range: a set of all possible values for the dependent variable
$y=\sqrt{x+1}$
$y=\frac{3 x-4}{4 x+10}$
$y=\left\{\begin{array}{c}1-x, x<1 \\ \sqrt{x-1}, x \geq 1\end{array}\right.$

Even and Odd Functions:

$$
\begin{aligned}
& \text { If } f(-x)=-f(x), \text { then the } f \text { unction is odd } \\
& \text { If } f(-x)=f(x) \text {, then the } f \text { unction is even } \\
& \boldsymbol{y}=\mathbf{3} \boldsymbol{x}^{\mathbf{2}} \\
& \boldsymbol{y}=\mathbf{2} \boldsymbol{x}^{2}+\mathbf{4} \boldsymbol{y}=\mathbf{4} \boldsymbol{x}^{\mathbf{3}}
\end{aligned}
$$

End Behavior:
-If the degree of $f$ is even and the lead term coefficient is positive, then the left and right ends of the function both approach positive infinity.
-If the degree of $f$ is even and the lead term coefficient is negative, then the left and right ends of the function both approach negative infinity.
-If the degree of $f$ is odd and the lead term coefficient is positive, then the left end approaches negative infinity and the right end approaches positive infinity.
-If the degree of $f$ is odd and the lead term coefficient is negative, then the left end approaches positive infinity and the right end approaches negative infinity.

$$
f(x)=-3 x^{2}+4 x-2
$$

$$
f(x)=2 x^{3}-3 x^{2}+6 x-1
$$

$$
f(x)=5 x^{5}-6
$$

Functions

$$
\begin{array}{ll}
f(x)=x^{2}-4 x+7 \\
f(4)= & f\left(y^{3}\right)=
\end{array} f(x+y)=
$$

$$
f(x)=2 x-3 \quad g(x)=x^{2}+1
$$

$$
f(x) \cdot g(x)
$$

$$
f(g(x))
$$

$$
g(f(x))
$$

## Inverse Functions

In order to calculate an inverse of a function algebraically, you must switch all of the $x$ and $y$ variables and solve the new equation for y . The inverse only exists if the resulting equation is a function.

$$
f(x)=3 x+2 \quad f(x)=2 x^{2}-4 \quad f(x)=\sqrt{x+1}
$$

Logarithms
Natural Logarithmic Function:

$$
\ln x=b \text { if and only if } e^{b}=x
$$

Inverse Properties of Logarithms:

$$
\ln e^{x}=x \quad e^{\ln x}=x
$$

$$
10+e^{0.1 x}=14
$$

$$
3+2 \ln x=7
$$

$$
f(x)=\ln (x-2)+3 \quad f(x)=-2+e^{x+1} \quad f(x)=\left\{\begin{array}{c}
\ln x+1, x<1 \\
e^{x-1}, x \geq 1
\end{array}\right.
$$



Properties of Logarithms
Product Property: $\quad \log _{b} a+\log _{b} c=\log _{b}(a c)$
Quotient Property: $\quad \log _{b} a-\log _{b} c=\log _{b}\left(\frac{a}{c}\right)$
Power Property: $\quad \log _{b} a^{c}=c \cdot \log _{b} a$
$4 \ln x+6 \ln y-\ln z$

$$
\frac{1}{3}\left[2 \ln (x+3)+\ln x-\ln \left(x^{2}-1\right)\right]
$$

