Instructions: For each group (groups are separated by horizontal lines), match term or quantity in left column to descriptions that apply from the right column. There may be more than one match that is possible, and you might not use all the items from the right column in each group.

Local Maximum _____

Asymptote _____

Vertical Asymptote _____

Concave Up _____

Horizontal Asymptote _____

Point of Inflection _____

Concavity _____

Concave Down _____

Absolute Maximum _____

Extrema _____

1. The quantity $x = a$ is called this if $\lim_{x \to a} f(x) = \pm\infty$.
2. A vertical or horizontal line on a graph which a function approaches.
3. Measures how a function *bends*, or in other words, the function's curvature.
4. If $\lim_{x \to \pm\infty} f(x) = L$, then $y = L$ is called this.
5. If the function $f(x)$ is above its tangent line at $x = a$, then the function has this property at $x = a$. The function has this property if $f''(a) > 0$.
6. The function $f(x)$ could have this property if $f'(a) = 0$.
7. Occurs if the function changes concavity at $x = a$. This is possible if $f''(a) = 0$.
8. If the function $f(x)$ is below its tangent line at $x = a$, then the function has this property at $x = a$. The function has this property if $f''(a) < 0$.
9. Any of the maximum or minimum values for a function.
10. The largest value the function takes over its entire domain.

Antidifferentiation _____

Derivative dy/dx _____

Antiderivative _____

Differentiation _____

Constant of Integration _____

Differential _____

Family of Curves _____

1. This quantity involves a constant, usually something like $g(x) + C$ (although other forms are possible), and when you assign different values to the constant C you get different curves.
2. The process of finding the derivative of a function $f(x)$.
3. A family of curves.
4. The process of finding an antiderivative of a function $f(x)$.
5. Informally, this quantity can be written as dx and represents a small amount of x.
6. This quantity is included when an antidifferentiation is performed.
7. This quantity represents the instantaneous rate of change of y with respect to the variable x.

$e^{x+y} =$ ______

$\ln(e^x - e^y) =$ ______

$\ln(e^{x-y}) =$ ______

1. $e^x + e^y$
2. $e^x e^y$
3. $(x+y)e^{x+y-1}$
4. $x - y$
5. xy
6. $\dfrac{x}{y}$
7. $\ln(e^x - e^y)$

Displacement ______

Indeterminant Form ______

Differentiation ______

Distance Traveled ______

Integration ______

1. This quantity is always non-negative. If $v(t)$ is the velocity, this quantity is given by $\int_{t_1}^{t_2} |v(t)|\, dt$.
2. $\lim_{h \to 0} \dfrac{g(x+h) - g(x)}{h}$
3. How far a particle has moved during a time interval from t_1 to t_2. If $v(t)$ is the velocity, this quantity is given by $\int_{t_1}^{t_2} v(t)\, dt$.
4. Mathematically easy.
5. Mathematically hard.

Slope of tangent line to a curve at a point ______

Equation of a straight line ______

Implicit function in $\mathbb{R}^2$ ______

Explicit function in $\mathbb{R}^2$ ______

Surface in $\mathbb{R}^3$ ______

Space curve in $\mathbb{R}^3$ ______

1. $\dfrac{x - x_0}{y - y_0} = \dfrac{x_1 - x_0}{y_1 - y_0}$
2. The derivative of the function.
3. The derivative of the function evaluated at the point.
4. $z = f(x, y)$
5. $f(x, y) = 0$
6. $y = f(x)$
7. $y - y_0 = m(x - x_0)$
8. $x = f(t), y = g(t), t > 0$
9. $x = f(t), y = g(t), z = h(t), t > 0$

$\dfrac{d}{dx}\left[\sin(x^3)\right] =$ ______

$3 \int x^2 \sin(x^3)\, dx =$ ______

1. $-\cos(x^3)$
2. $\cos(x^3)$
3. $-3x^2 \cos(x^3)$
4. $3x^2 \cos(x^3)$

Integration ______

Definite Integral ______

Indefinite Integral ______

Improper Integral ______

Integral ______

Limits of Integration ______

Integrand ______

FTC Part 1: $\frac{d}{dx}\int_a^x w(t)\,dt =$ ______

FTC Part 2: $\int_a^b \frac{d}{dx}[w(x)]\,dx =$ ______

1. Formally, this quantity looks like $\int f(x)\,dx$. When evaluated it yields a family of curves as the solution.
2. The process of evaluating an integral (definite, indefinite, or improper) of a function $f(x)$.
3. Formally, this quantity looks like $\int_a^b f(x)\,dx$ where the integrand $f(x)$ is infinite for some $x \in [a, b]$, or $a \to -\infty$ or $b \to \infty$.
4. For $\int_a^b f(x)\,dx$, this quantity is $f(x)$.
5. Used as a way to refer to any of the specific types of integrals.
6. For $\int_a^b f(x)\,dx$, this quantity is a and b.
7. Formally, this quantity looks like $\int_a^b f(x)\,dx$. When evaluated it yields a number.
8. $w(x)$
9. $w(b) - w(a)$

$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] =$ ______

$\frac{d}{dx}[f(x)g(x)] =$ ______

$\frac{d}{dx}[f(g(x))] =$ ______

1. $f'(g(x))$
2. $f(g'(x))$
3. $f'(g(x))g'(x)$
4. $f'(g'(x))g'(x)$
5. $\frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$
6. $\frac{g(x)f'(x) - f(x)g'(x)}{g(x)}$
7. $\frac{g'(x)f'(x) - f(x)g(x)}{(g(x))^2}$
8. $\frac{g(x)f'(x) + f(x)g'(x)}{(g(x))^2}$
9. $f'(x)g'(x)$
10. $f'(x)g(x) + f(x)g'(x)$
11. $f(x)g(x)$
12. $g(x)$

Related Rates ______

Implicit Differentiation ______

Logarithmic Differentiation ______

Optimization Problems ______

l'Hospital's Rule ______

Finding Points of Inflection ______

1. Could be used to evaluate $\frac{d}{dx}[x^x]$.
2. Involves finding relationships between rates of changes.
3. Could be used to find dy/dx if $\sin(xy) = \cos(xy)e^{x/y}$.
4. Requires the use of the chain rule of derivatives.
5. Involves finding an extrema for a function.
6. Involves setting a derivative equal to zero.
7. Involves the quotient rule of derivatives.
8. Is used to figure out indeterminant forms.
9. Is used to figure out indeterminant forms, but can only be used on indeterminant quotients. Others indeterminant forms need some work before you can use it.

$\frac{d}{dx}\tan x =$ ______

$\int_1^x \frac{\ln t}{t}\,dt =$ ______

$\frac{d}{dx}\arctan x =$ ______

$\int_1^x \frac{1}{t}\,dt =$ ______

1. Can be worked out using the quotient rule of derivatives and a trig identity. Do it!
2. Can be worked out from a derivative rule. Do it!
3. Can be worked out using implicit differentiation. Do it!
4. Can be worked out using a substitution. Do it!
5. $-\frac{1}{x^2}$
6. $\ln x$
7. $\frac{1}{2}(\ln x)^2$
8. $\frac{1}{1+x^2}$
9. $\sec^2 x$

Partial Differentiation ______

Implicit Differentiation ______

$\frac{d}{dx}\left[\cos(y) = e^{x-\sin y}\right]$ **is** ______

$\frac{\partial}{\partial x}\left[\cos(y) = e^{x-\sin y}\right]$ **is** ______

1. Involves holding a variable fixed (treating it as a constant), and then using the regular derivative rules.
2. Involves taking the derivative of an implicit function, and requires you to remember that one of the variables is a function of the other.
3. a partial derivative.
4. an implicit derivative.
5. equivalent to $-\sin y\frac{dy}{dx} = e^{x-\sin y}\left(1-\cos y\frac{dy}{dx}\right)$.
6. equivalent to $0 = -e^{x-\sin y}$.
