Derivative Drill Worksheet

Part 1

1. $y = \sqrt{x} + 3x^2$
2. $y = \frac{1}{x^{350}} - 25$
3. $y = 5000$
4. $y = x^{1999}$
5. $y = 4\sqrt[3]{x} + \frac{5}{x} - x^{\frac{7}{8}}$
6. $y = \frac{5-x^3}{x^7}$
7. $y = (x + x^2)^2$
8. $y = \frac{2x^7 - \frac{1}{5}x^{-1}}{x^2}$
9. $y = \frac{7}{\sqrt[5]{x^4}}$
10. $y = \frac{x}{\sqrt[3]{x^2}}$
11. $y = 5x^4 + 7x^3 - 3x^2 + 10$
12. $y = ax^3 + c\sqrt{x}$
13. $y = x^{\frac{n}{q}}$

Part 2

1. $y = 2^x$
2. $y = \frac{1}{2}^x$
3. $y = \sqrt{5^x}$
4. $y = e^x + x$
5. $y = 3e^x + x^e$
6. $y = 3 \cdot 2^x + \frac{1}{2}^x$
7. $y = 4^{-x} + 4^x$
8. $y = \pi^x + 5e^x$
9. $y = a^x + 2^x + x^2$
10. $y = \frac{3}{5}^{-x}$

Part 3

1. $y = x^2 \cdot x^2$

2. $y = x^3(x^2 + x^7 + 3 + 5^x)$

3. $y = \frac{x^3}{7x^2 - \sqrt{x}}$

4. $y = \frac{x^2}{7^x}$

5. $y = \frac{x^3 + 3x^2 - 5}{5x^{10} - 7x^5}$

6. $y = \frac{e^x + x^3}{\frac{1}{2}^x - \sqrt[4]{x}}$

7. $y = (e^x + x^3)(\frac{1}{2}^x - \sqrt[4]{x})$

8. $y = ax^b \cdot c^x$

9. $y = x^2 \cdot 5^x \cdot 2^{2x}$

10. $y = \frac{x^b}{c^x}$

11. $y = \frac{1 + x^3}{50 - e^x}$

12. Let $h(x) = f(x)g(x)$ and $k(x) = \frac{f(x)}{g(x)}$. Given the table below find $h'(1), h'(2), \ldots, h'(7)$, and $k'(1), k'(2), \ldots, k'(7)$, if they exist.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	4	-10	0.5	5
2	2	-5	-0.125	5.5
3	5	-1	-0.0675	6.3
4	3	0	-1	7
5	3	7	-3	5
6	7	16	-3	5
7	20	45	-4	3

Part 4

1. $y = (x + x^2)^4$
2. $y = \sqrt{e^t}$
3. $y = 2^{3x}$
4. $y = \sqrt{x^2 + 5}$
5. $v = e^{2-5s}$
6. $y = 6^{ax}$
7. $y = \frac{1}{1+3^x}$
8. $z = e^{(w^2+3)^{10}}$
9. $y = 2^{e^x}$
10. $s = (t + 2^t)e^{t^2}$
11. $y = \sqrt[3]{a^{(2-x)}}$
12. Let $h(x) = f(g(x))$ and $k(x) = g(f(x))$. Given the table below find $h'(1), h'(2), \ldots, h'(6)$, and $k'(1), k'(2), \ldots, k'(6)$, if they exist.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	2	2	20	-5
2	2	3	19	-4
3	5	6	17	-2
4	6	5	13	0
5	3	4	5	7
6	3	1	-2	22

13. Find the linearization (or linear approximation) of $h(x)$ and $k(x)$ at $x = 4$. (Hint: A linear approximation is the equation of the line that is very close to the graph at $x = 4$. It should touch the graph and have the same slope as the graph. Which line could that be?)

Part 5

1. $y = \sin(x^2)$
2. $v = \sin^2(t)$
3. $y = \cos(e^\theta)$
4. $y = \tan(\frac{1}{x})$
5. $y = x^2 \sin x$
6. $w = 2^x \sin(x^7)$
7. $y = \cos(\sin z)$
8. $y = \sec x$
9. $y = \csc x$
10. $y = \cot x$
11. $y = \sin^2 x + \cos^2 x$
12. $\psi = \frac{\sin^2 \phi}{\cos^2 \phi}$
13. $y = \frac{\sin \sqrt{x}}{2x^4+5}$
14. $y = x \tan x$
15. $y = \sin(-\theta)$
16. $y = \sin(ax^2 + bx + c)$
17. $y = \cos(\tan x) \sec x$
18. $y = \frac{\theta \cos(\sin \theta)}{\tan(e^\theta)}$
19. $y = \frac{\sin^4 x \cot x \csc x \tan x}{\cos x(1-\cos^2 x) \sec x}$

Part 6

1. $y = \arctan(x^2)$
2. $y = \arctan(\ln x)$
3. $y = \ln(\sqrt{x})$
4. $y = 3\arcsin(\cos x)$
5. $y = \arccos(x)$
6. $y = e^x \ln x$
7. $y = x^2 \ln x^2$
8. $y = \frac{x^3}{\ln x}$
9. $y = \ln x^a$
10. $y = \sqrt{\arctan(x^3)}$
11. $y = \log_7 x$
12. $y = \log_\pi 2^x$

Part 7

1. $y^2 = x^2$
2. $\tan y = e^x$
3. $\frac{(x-2)^2}{y} = y + 1$
4. $x^3 + y^4 = -11$ Find the equation of the tangent line to the curve at $(-3, 2)$.
5. $\ln(xy) = x^2$
6. $y = x^x$
7. $y = (\sin x)^{\cos x}$
8. $y = (\ln x)^{x^2}$
9. $\log_x y = 5x$
10. $\arctan(y^2) = \sqrt{x}$

Part 8

1. $\lim_{t\to 0} \dfrac{\cos t - 1}{t}$

2. $\lim_{x\to 0} \dfrac{e^x - 1 + x}{x}$

3. $\lim_{x\to \infty} \dfrac{3x^2 + 5}{\ln x}$

4. $\lim_{x\to 0} \dfrac{\cos x - 1}{x^2}$

5. $\lim_{t\to 0} \dfrac{\tan t}{t}$

6. $\lim_{\theta\to \infty} \dfrac{\sqrt[3]{\theta}}{\ln \theta}$

7. $\lim_{x\to \infty} e^{-x} \ln x$

8. $\lim_{x\to 0^+} e^{-x} \ln x$

9. (a) Find the local linearization of $y = \cos(\sqrt{x})$ at $x = \pi^2$.

   (b) Find the best linear approximation of $y = \cos(\sqrt{x})$ at $x = \pi^2$.

   (c) Find the equation of the tangent line to $y = \cos(\sqrt{x})$ at $x = \pi^2$.

   (d) Find the local linearization of $y = f(x)$ at $x = a$.

   (e) Draw a picture illustrating the local linearization of a function at a point.