Derivative Techniques Mini Review _____

1. If $f(x) = 7x^3 - 5x^2 + 8x - 400$, then $\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ = _____

2. $\frac{d}{dx}\left[\sqrt[4]{x^3}\right]$ = _____

3. $\frac{d}{dx}\left[-\frac{8}{x^5}\right]$ = _____

❖ Use the scenario below to answer questions 4 – 9

Water flows into a pipe that has a hole in it that increases in size as more water flows into it. The amount of water in the pipe is modeled by the function $w(t) = 6t - t^2$, where t is measured in minutes and $w(t)$ is measured in gallons.

4. What is the value of $w(2)$ and what does it represent in the context of this problem? Include units of measure.

5. What is the average rate of change of the water in the pipe from $t = 1$ to $t = 4$ minutes?

6. When does $w'(t) = 0$? What does it represent in the context of this problem? Include units of measure.

7. When does $w'(t) = -2$? What does it represent in the context of this problem? Include units of measure.

8. When does the graph of $g(x) = \frac{1}{3}x^3 + 3x^2 - 27x + 4$ have horizontal tangents?

9. For $y = 5x^4 - 8x^3 + 10x^2 + 19x - 43$, find:

$\frac{dy}{dx} =$ _____ $\frac{d^3y}{dx^3} =$ _____

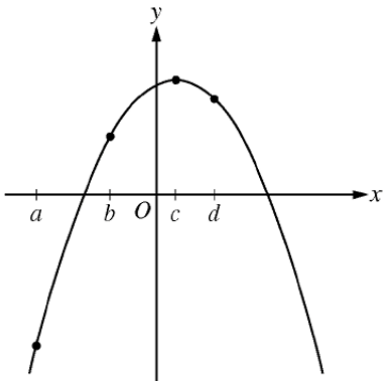
$y'' =$ _____ $y^{(4)} =$ _____

10. For $f(x) = 4x^3 - 5x^2 + 3x - 7$:

A. Find the equation of the tangent line of $f(x)$ at $x = -2$ _____

B. Find the equation of the normal line of $f(x)$ at $x = -2$. _____

11. Given the graph of $g(x)$ below, arrange the values of $g'(b), g'(c), and\ g'(d)$ in order from least to greatest.



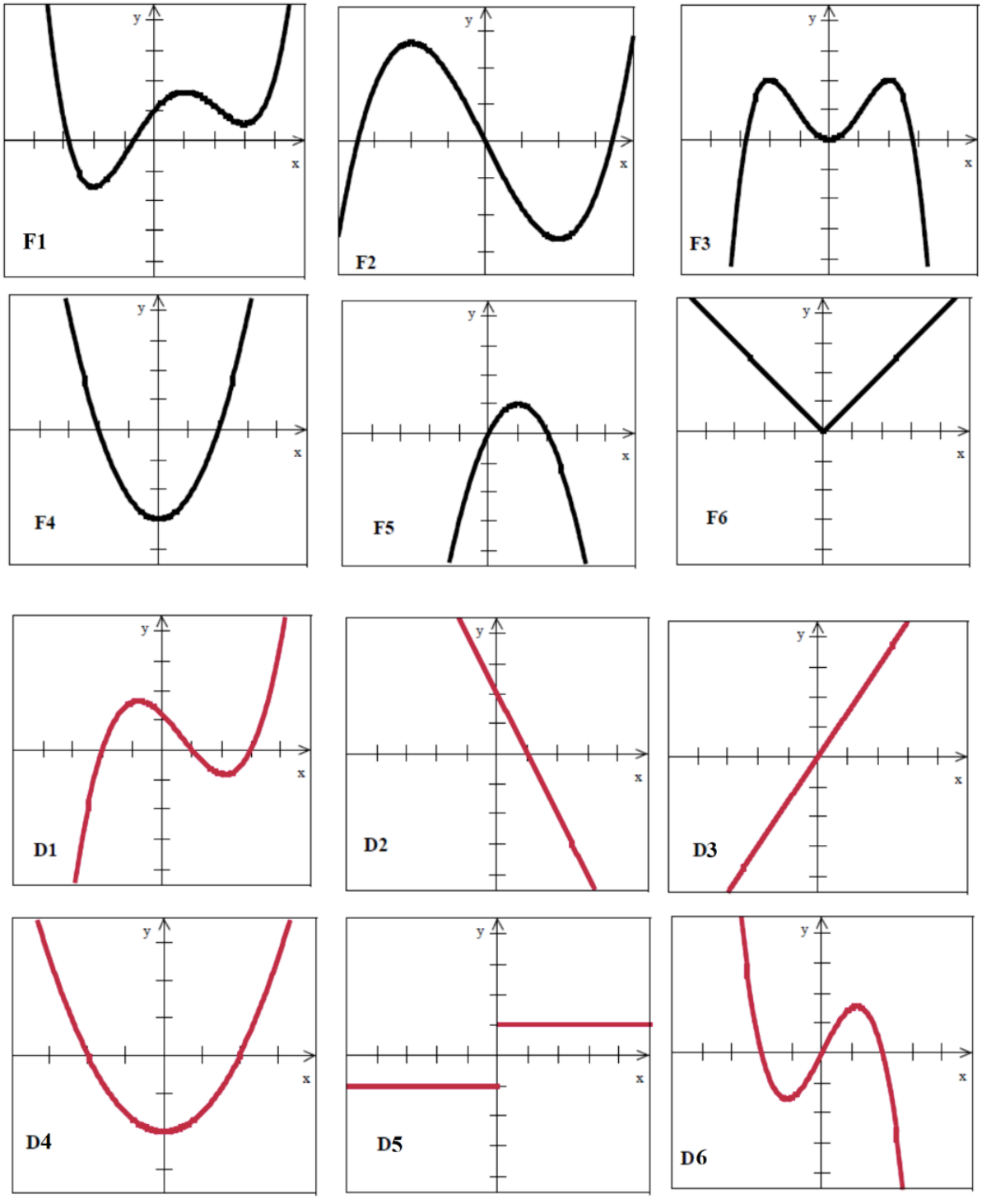
_____

12. If $f(x) = (x^2 - 9)^5$, then $f'(x)$ = _____

13. $\frac{d}{dx}[sin^4(8x + 3)]$ = _____

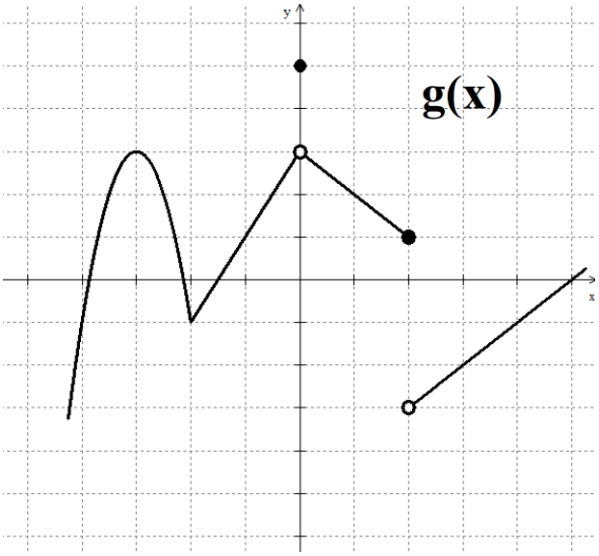
14. If $f(x) = \sqrt{4x}$, then $f'(36) =$ _____

15. Match the graphs of $f(x)$ with the derivative $f'(x)$. (F = Function, D = Derivative)



F1 _____ F2 _____ F3 _____ F4 _____ F5 _____ F6 _____

❖ Use the graph of $g(x)$ below to answer questions 16 – 21.



16. Name all locations where $g(x)$ is not continuous.

17. Name all locations where $g(x)$ is not differentiable.

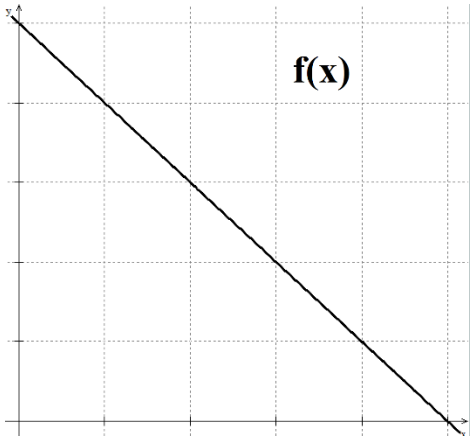
18. Where is $g(x)$ continuous, but not differentiable?

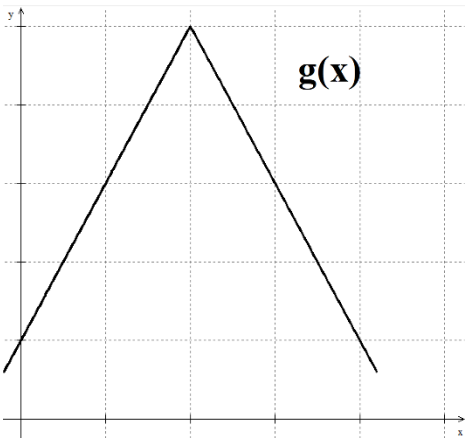
19. $\lim_{x\to -3} \frac{g(x)-g(-3)}{x+3} = g(5)$ (True or False)

20. $\lim_{x\to 0} g(x) = g'(-2)$ (True or False)

21. $\lim_{h\to 0} \frac{g(4+h)-g(4)}{h} = g'(-1)$ (True or False)

❖ Use the graphs of $f(x)$ *and* $g(x)$ below to answer questions 22 – 26.





22. If $h(x) = f(x) \cdot g(x)$, then $h'(4) =$ _____

23. If $r(x) = \frac{f(x)}{g(x)}$, then $r'(1) =$ _____

24. If $p(x) = \frac{g(x)}{f(x)}$, then $p'(2) =$ _____

25. If $\mathrm{d}(x) = f(g(x))$, then $d'(3) =$ _____

26. If $\mathrm{w}(x) = g(f(x))$, then $w'(1) =$ _____