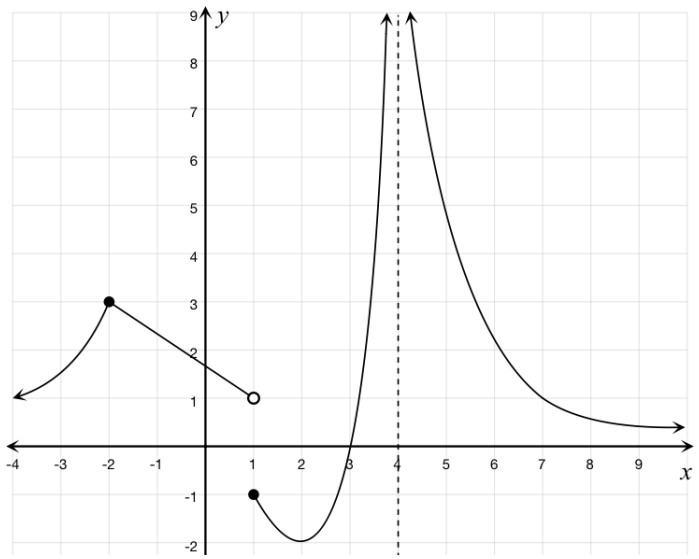
IB Math Standard Level Name: _____
Summer Work (review of Calculus)
Due Date: August 7, 2019

If you did not take calculus last year, you will need to watch calculus tutorial videos on derivatives, antiderivatives, and their applications on **www.patrickjmt.com or get a friend that had calculus to help you.

LIMITS: You will be expected to find a limit (overall or from the left or right) from a graph and also using methods such as direct substitution or factoring.

1.



(a) $\lim_{x\to -2} f(x) =$ _____
(b) $\lim_{x\to 4^+} f(x) =$ _____
(c) $\lim_{x\to 4^-} f(x) =$ _____
(d) $\lim_{x\to 4} f(x) =$ _____
(e) $\lim_{x\to 1^+} f(x) =$ _____
(f) $\lim_{x\to 1^-} f(x) =$ _____
(g) $\lim_{x\to 1} f(x) =$ _____
(h) f(1) = _____
(i) f(4) = _____
(j) f(7) = _____

2. $\lim_{x\to 2}\left(x^2+2x-3\right)$ = _____

3. $\lim_{x\to \pi/3} 2\cos x$ = _____

4. $\lim_{x\to 3}\dfrac{x^2-9}{x-3}$ = _____

5. $\lim_{x\to 3}\dfrac{2x^2-5x-3}{2x-6}$ = _____

6. $\lim_{x\to -5}\dfrac{x^3+125}{x+5}$ = _____

7. $\lim_{x\to \infty}\dfrac{2x^2}{3x^2+5}$ = _____

DERIVATIVES: You will be expected to know how to find the derivative using the power rule, product rule, quotient rule, trig rules, chain rules, etc and then use the derivative to find the tangent line, normal line, increasing/decreasing, relative extrema, concavity, and inflection points.

Find the derivative:

8. $f(x) = 2x^4 - 3x^3 + 6x^2 - 8x + 5$ 8. _____

9. $f(x) = 5\cos x + 3\sin x - 2e^x + \ln x$ 9. _____

10. $f(x) = x^2e^x$ 10. _____

11. $f(x) = \frac{3x-4}{5x^2+1}$ 11. _____

12. $f(x) = 2\sin(4x - 1)$ 12. _____

13. $f(x) = \sqrt{3x^2 + 5}$ 13. _____

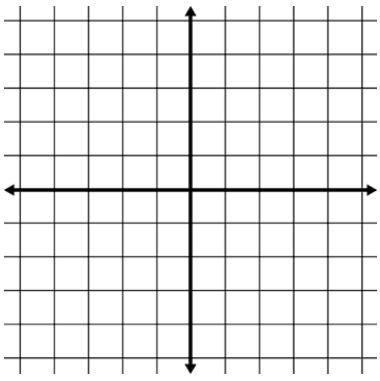
14. $f(x) = -3\ln(1 - 2x)$ 14. _____

15. $f(x) = \frac{4}{(2x^3+5x)}$ 15. _____

16. $f(x) = -e^{cosx}$ 16. _____

17. Find the equation of the tangent line and normal line to the given function at the indicated x-value. Graph f(x) and the tangent and normal line on the grid provided.

$f(x) = x^2 - 4$ at x = -1



Tangent line: _____

Normal Line: _____

18. **Using calculus**, find the x-value(s) of the critical points, the intervals that f(x) is increasing and decreasing, the coordinates of the local max and min of f(x), the intervals that f(x) is concave up and down, and the coordinates of the inflection points of f(x)

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

Critical Points: _____

Increasing: _____

Decreasing: _____

Local Max: _____

Local Min: _____

Concave up: _____

Concave down: _____

Inflection point(s): _____

ANTIDERIVATIVES: You will be expected to know how to find the antiderivative of basic functions and also composite functions using u-substitution. You will need to know how to use the fundamental theorem of calculus to evaluate definite integrals by hand.

Find the antiderivative.

19. $\int (3x^2 - 4x + 5)\, dx$ 19. _____

20. $\int \left(3\sin x - 2\cos x + 4e^x - \frac{2}{x}\right) dx$ 20. _____

21. $\int (2x - 1)^5\, dx$ 21. _____

22. $\int \cos 4x \;\; dx$ 22. _____

23. $\int -3e^{2x} \;\; dx$ 23. _____

Evaluate the following **by hand** (no calculator) giving your answer as a **simplified exact value**. (all correct steps must be shown)

24. $\int_1^3 (4x^3 - 3x^2 + 1)\, dx$ 24. _____

25. $\int_1^e \frac{1}{x}\, dx$ 25. _____

26. $\int_0^{\pi} \cos(2x)\, dx$ 26. _____

27. $\int_1^5 \sqrt{3x+1}\, dx$ 27. _____

CALCULATOR SKILLS: You will be expected to know to find the zeros of a function, max/min, intersection point, derivative at a point – math 8, and definite integrals – math 9 using the graphing calculator.

28. Find the zeros of the function given the interval. Show a basic sketch of your graph. Round answers to 3 significant figures.

$f(x) = \sin(x^2) + \ln x$ from $0 \le x \le 3$ 28. _____

29. Find the coordinates of the intersection point(s). Show a basic sketch of your graphs. Round to 3 significant figures.

$f(x) = x^2 + 2x - 1$ and $g(x) = 3x + 2$ 29. _____

30. Find all of the **<u>coordinates</u>** of relative extrema for $f(x) = \cos(x^2 - 1)$ from $0 \leq x \leq \pi$. Round to 3 significant figures. Show a basic sketch of your graph.

Relative Max(es): _____

Relative Min(s): _____

Using the calculator to evaluate the following (Math 8 or Math 9), round to 3 significant figures:

31. Find $f'(0.5)$ if $f(x) = \frac{3lnx - \sin(2x) + \sqrt{x}}{e^{5x} - 1}$ 31. _____

32. $\int_{0.372}^{1.598} 2e^{3\sin x}\, dx$ 32. _____