Calculus AB Chapter 4 Exam

I acknowledge that I have read and agree to the Crespi Carmelite High School Academic Integrity Contract (page 24 of the Parent/Student Handbook), and I agree to complete this exam in accordance with the contract's stipulations.

Name and period: _____

Signature: _____

DO NOT BEGIN UNTIL INSTRUCTED TO DO SO

You have until the end of the period to finish this exam. If you happen to finish early please have a seat until the end of the period. The exam is worth **100 points**. You are allowed to write on this exam.

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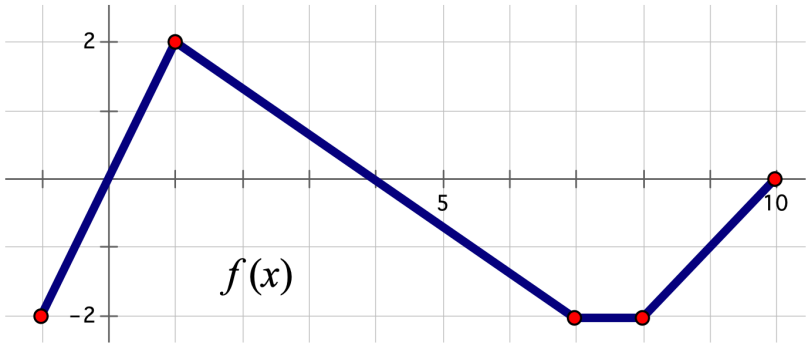
Differentiate the following functions using an appropriate technique. If you are unsure how to continue, state the technique you think could be used.

1. $y = (3x^3 - 2x^2)(3x^3 + 2x^2)$
2. $y = e^{\csc(3x^2)}$
3. $m(z) = \sqrt{(2x-3)^5}$
4. $y(x) = x + \tan^{-1}(3x^2)$
5. $T(x) = \dfrac{\ln(\sin(x))}{x^2+1}$

Evaluate the following integrals using an appropriate technique.

6. $\displaystyle\int (x^3+1)(x^2+5)\,dx$
7. $\displaystyle\int \frac{x^2-1}{x^2} + \frac{2}{1-5x}\,dx$
8. $\displaystyle\int 3e^{5-3x} + \sin(\tfrac{\pi}{2}x) + \frac{3}{\sqrt{1-x^2}}\,dx$
9. $\displaystyle\int \frac{1}{(x-2)(x+5)}\,dx$

10. (10 points) The function g, is a differentiable functions with the following values. The graph of f is provided. Using the chart below find $h'(x)$ at the indicated point:



x	$g(x)$	$g'(x)$
0	-2	12
2	0	-3
4	5	5
6	3	8
8	-4	11

(a) Find the equation of the tangent line to $g(x)$ at $x = 4$.

(b) If $K(x) = \dfrac{1}{f(f(x))}$, find $K'(4)$.

(c) If $T(x) = g(f(x))$, find $T'(1)$.

(d) If $J(x) = \dfrac{f(2x)}{g(3x)}$, find $J'(2)$.

11. (10 points) Find the following using:

$$f(x) = \frac{1}{3}x^3 + 5x^2 + \ln(e)$$

(a) State the OPEN intervals over which f is decreasing. Justify your response.

(b) State the x-values at which the function has any local extrema and find its value. Justify your response.

(c) State the x-values at which the function has a point of inflection. Justify your response.

12. (10 points) The velocity of a XC [1] runner on their last mile is described by $v(t) = t^2 - 8t + 15$.

(a) Find the acceleration of the runner at $t = 2$.

(b) Find the position function of the runner if $x = 5$ when $t = 0$.

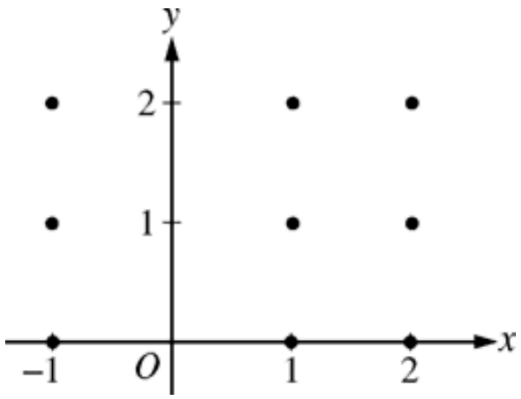
(c) Find the position the first time the runner changes direction.

13. (10 points) Approximate $\sqrt[3]{(1001)^4}$. Determine whether this is an over or under approximation.

14. (10 points) Consider the differential equation

$$\frac{dy}{dx} = \frac{(y-1)}{x^2}$$

(a) On the axis provided, sketch the slope field for $\frac{dy}{dx}$ at all points plotted on the graph.



(b) Find the particular solution $y = f(x)$ that passes through $f(2) = 0$.

[1] XC - cross country