IB Math SL Name_____

Additional Chapter 7 Review

Write equations to optimize the given situations. Then solve.

1) Find two nonnegative numbers whose sum is 9 and so that the product of one number and the square of the other number is a maximum.

2) An open rectangular box with square base is to be made from 48 cm^2 of material. What dimensions will result in a box with the largest possible volume ?

3) A normal 12 oz can of soda has a volume of 355 cm^2 Find the dimensions (radius r and height h) that minimize the material used to construct the can. Round dimensions to the nearest tenth.

For each problem, find all points of absolute minima and maxima on the given interval.

4) $y = x^2 - 4x + 6; \quad [0, 3]$

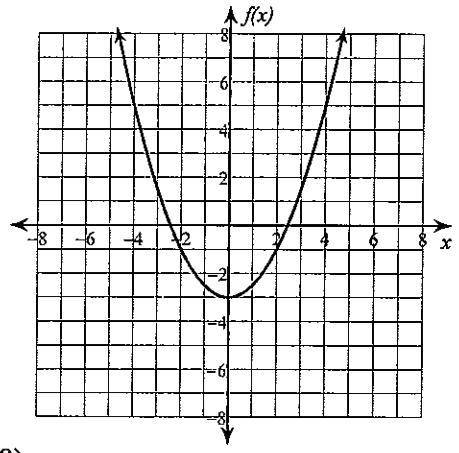
A particle moves along a horizontal line. Its position function is $s(t)$ for $t \geq 0$. For each problem, find the velocity function $v(t)$, the acceleration function $a(t)$, the times t when the particle changes directions, the intervals of time when the particle is moving left and moving right, and the times t when the acceleration is 0. Then find when the velocity is increasing.

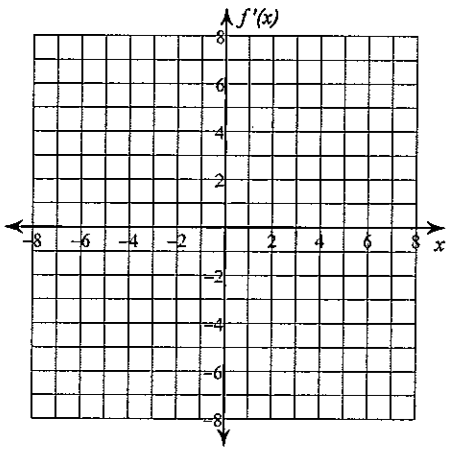
5) $s(t) = t^3 - 12t^2$

6) $s(t) = t^3 - 24t^2 + 144t$

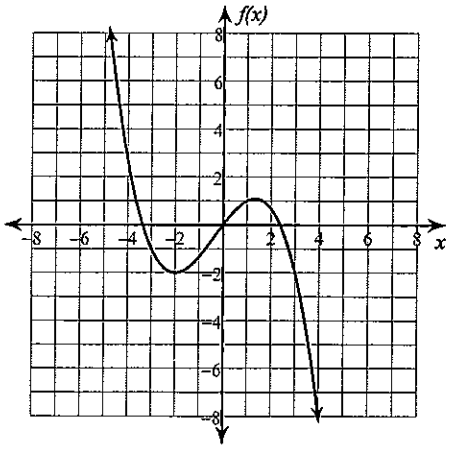
Given the graph of $f(x)$, sketch an approximate graph of $f'(x)$.

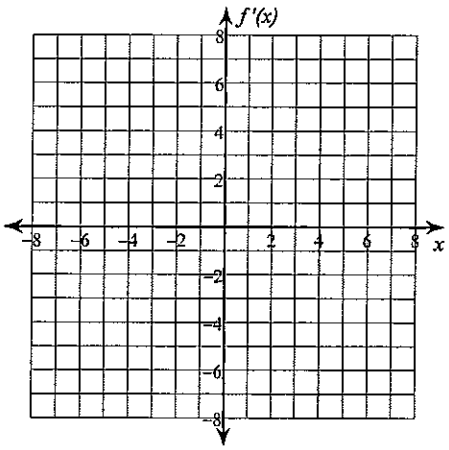
7)





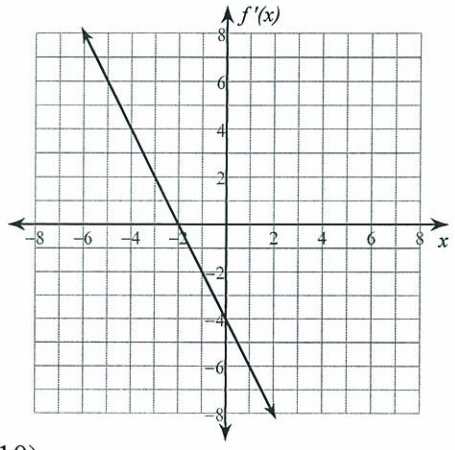
8)

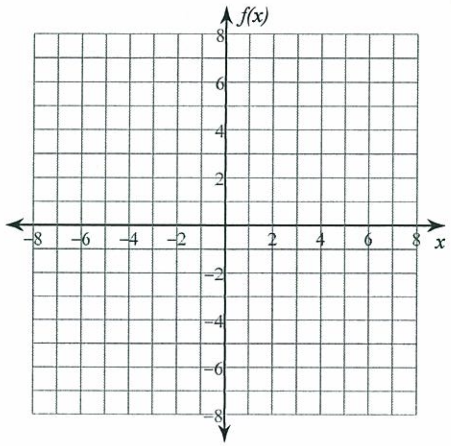




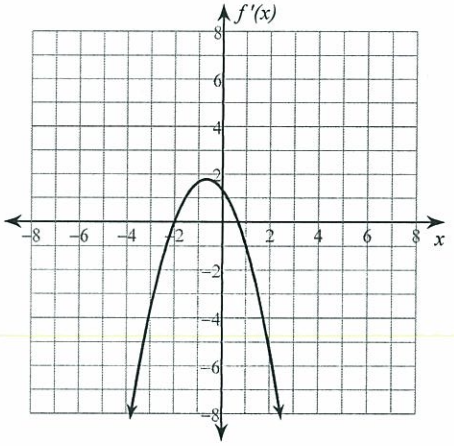
Given the graph of $f'(x)$, sketch a possible graph of $f(x)$.

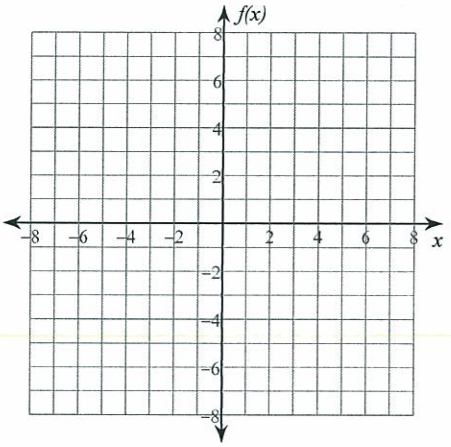
9)





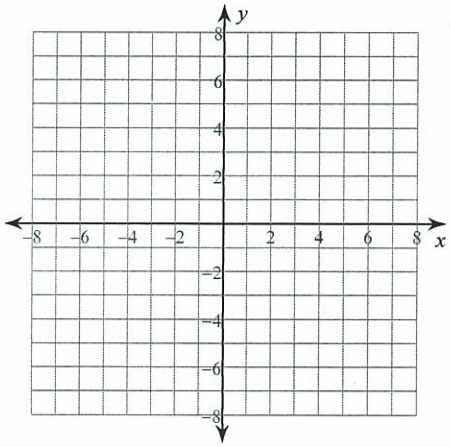
10)





Find the x and y intercepts, open intervals where the function is increasing and decreasing, the inflection point(s), open intervals where the function is concave up and concave down, and relative minima and maxima. Using this information, sketch the graph of the function.

11) $y = \frac{x^3}{3} + x^2$



Answers to Additional Chapter 7 Review

1) $x + y = 9$
$xy^2 =$ maximum
$x = 3$ and $y = 6$

2) $x^2 + 4xh = 48$
$x^2h = V$
4 cm x 4 cm x 2 cm

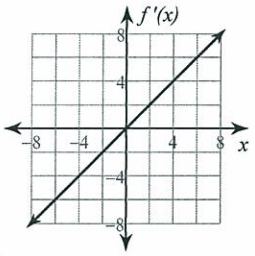
3) $\pi r^2 h = 355$
$2\pi r^2 + 2\pi rh = SA$
$r \approx 3.8cm$ and $h \approx 7.7cm$

4) Absolute minimum: $(2, 2)$
Absolute maximum: $(0, 6)$

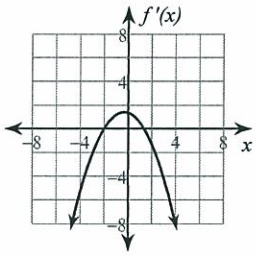
5) $v(t) = 3t^2 - 24t$, $a(t) = 6t - 24$
Changes direction at: $t = \{8\}$, Moving left: $0 < t < 8$, Moving right: $t > 8$
Acceleration zero at: $t = \{4\}$, Velocity increasing $t > 4$

6) $v(t) = 3t^2 - 48t + 144$, $a(t) = 6t - 48$
Changes direction at: $t = \{4, 12\}$, Moving left: $4 < t < 12$, Moving right: $0 \le t < 4$, $t > 12$
Acceleration zero at: $t = \{8\}$, Velocity increasing $t > 8$

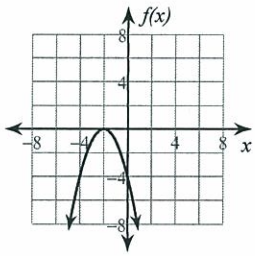
7)



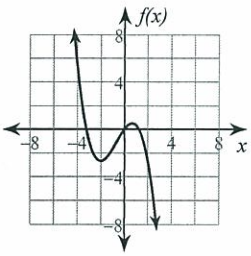
8)



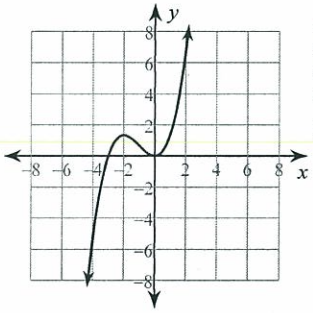
9)



10)



11)



x-intercepts at $x = -3, 0$ y-intercept at $y = 0$
Increasing: $(-\infty, -2), (0, \infty)$ Decreasing: $(-2, 0)$
Inflection point at: $(-1, 2/3)$
Concave up: $(-1, \infty)$ Concave down: $(-\infty, -1)$
Relative minimum: $(0, 0)$ Relative maximum: $\left(-2, \frac{4}{3}\right)$

Note:
#7: Actual slope of line may vary (but must be positive!)
#8: Actual y-value of max may vary!
#9+10: Actual y-value of min/max may vary.
Also your x+y intercepts may vary.

See the solutions for more info