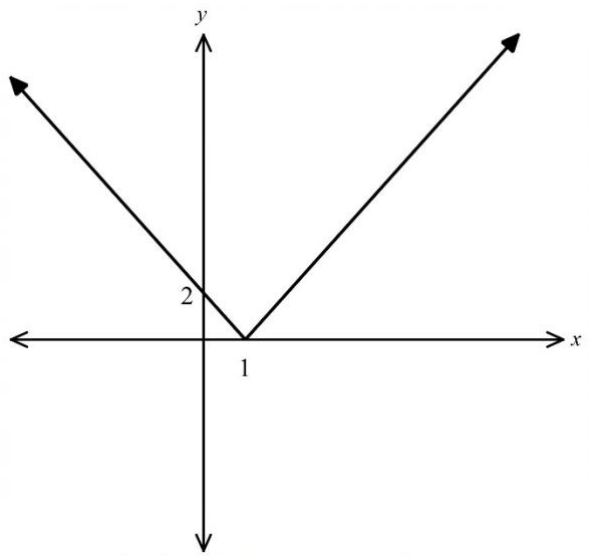
Name: _____ Due: _____

Year 12 Advanced Term 2 – Assignment 1

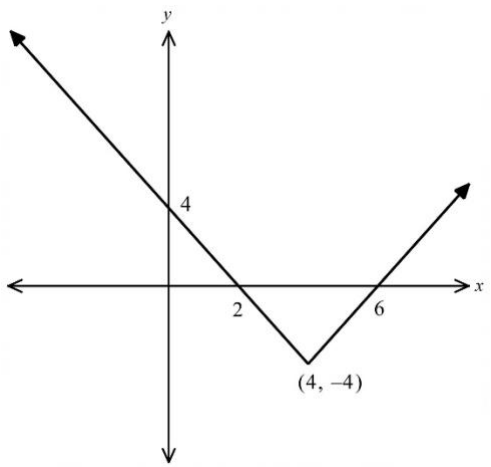
Section 1 – Multiple Choice

1. The graph of $y = f(x)$ is shown below.

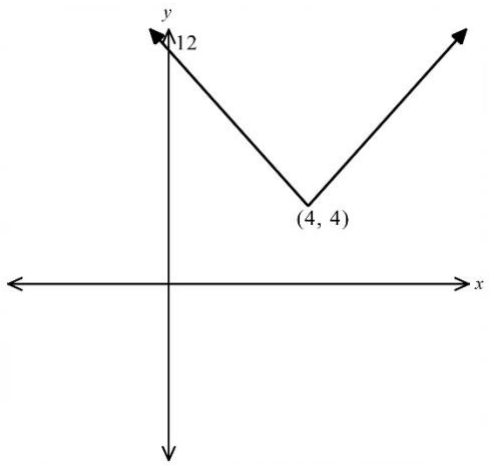


Which of the graphs below represents $y = f(x + 3) + 4$?

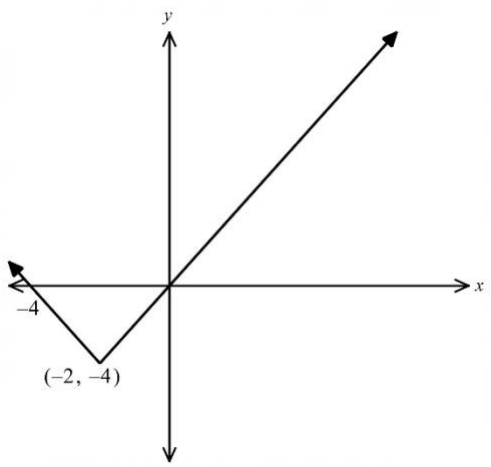
A.



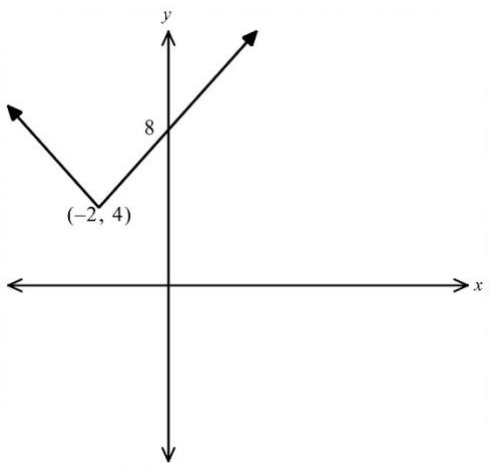
B.



C.



D.



2. Which of the following is equivalent to $\frac{d}{dx}\left(\frac{\sin x}{x^2}\right)$?

A. $\frac{\cos x}{2x}$

B. $\frac{x^2 \sin x - 2x \cos x}{x^4}$

C. $\frac{x \cos x + 2\sin x}{x^3}$

D. $\frac{x \cos x - 2\sin x}{x^3}$

3. What is $\int 6x^2 (4x^3 - 5)^3 \, dx$?

A. $\frac{(4x^3-5)^4}{8} + C$

B. $12x (4x^3 - 5)^4 + C$

C. $2x^3(4x^3 - 5)^4 + C$

D. $\frac{2x^3(4x^3-5)^4}{8} + C$

4. Which is the complete solution set to the equation $\sin^2\left(x + \frac{\pi}{6}\right) = \frac{1}{2}$,

for the domain $0 \leq x \leq 2\pi$?

A. $x = \frac{\pi}{12}, \frac{13\pi}{12}$

B. $x = 0, \frac{\pi}{2}, , \pi, \frac{3\pi}{2}$

C. $x = \frac{\pi}{12}, \frac{7\pi}{12}, \frac{13\pi}{12}, \frac{19\pi}{12}$

D. $x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{7\pi}{12}, \frac{9\pi}{12}, \frac{11\pi}{12}, \frac{13\pi}{12}, \frac{15\pi}{12}, \frac{17\pi}{12}, \frac{19\pi}{12}, \frac{21\pi}{12}, \frac{23\pi}{12}$

Section 2 – Show full working!

1. Express $\frac{2x}{x^2-4} - \frac{x+1}{x^2-x-2}$ as a single algebraic fraction, in simplest form.

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2. Find the equation of the normal to the curve $y = x^4 - 3x^2 + 18x + 24$ at the point where $x = -2$.

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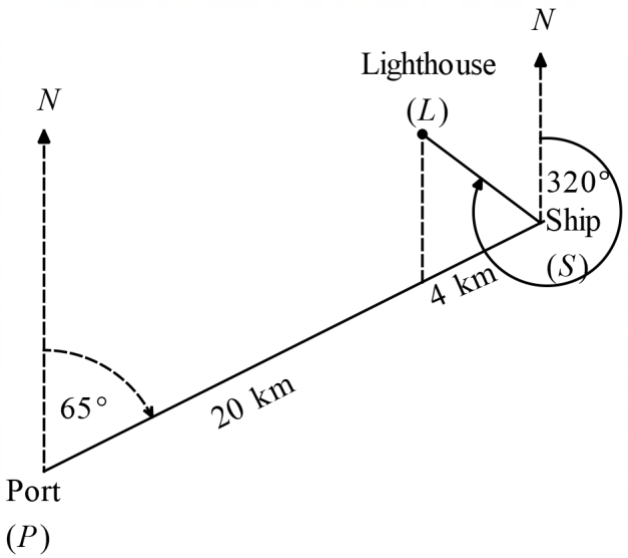
3. A ship leaves port travelling on a bearing of $065°$. After travelling 20 kilometres, the ship is due south of a lighthouse.

The ship continues on this bearing for a further 4 kilometres, then measures the bearing of the lighthouse to be $320°$.



Calculate the distance from the ship to the lighthouse at this time.

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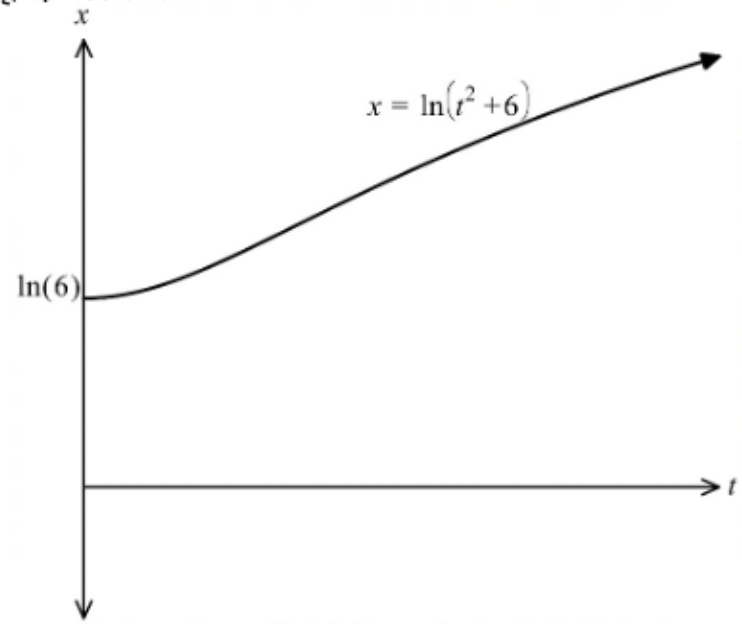
4. A particle moves on the x-axis so that it's displacement in metres from the origin at a time t seconds is given by the equation $x = \ln(t^2 + 6)$.

The particle starts from rest at the point $x = \ln(6)$ and accelerates in a positive direction as shown in the distance-time graph below.



Determine when the acceleration of the particle becomes zero and find the velocity at this time.

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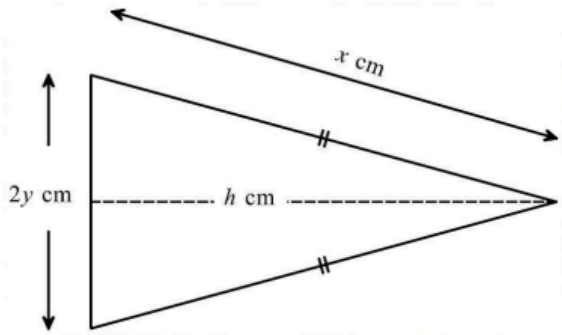
5. Use calculus to determine and verify the nature of the stationary points, find local maxima and minima and points of inflection (horizontal or otherwise) and hence sketch the graph of the function $y = 12x^5 - 15x^4 - 40x^3$. Accurate values for all x-intercepts are not required.

6. A banner is designed as an isosceles triangle, with equal sides of length x cm and base of length $2y$ cm, as shown.



The total perimeter of the triangle is 40 cm.

(a) Show that the area of the triangle in terms of x can written as:

$$A = (20 - x)(40x - 400)^{\frac{1}{2}}$$

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(b) Use calculus to find the values of x and y which give a maximum area and find this area.

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