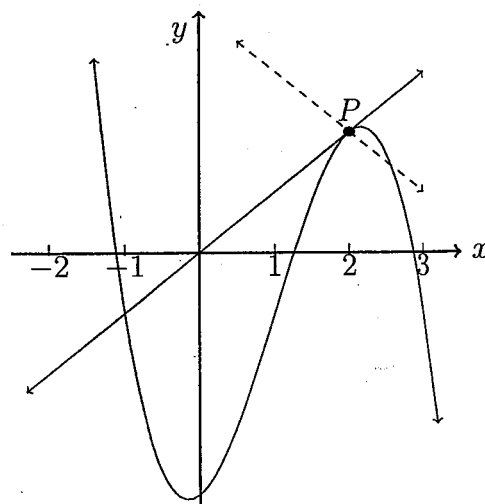


10 March 2020

### 6.9 Do Now Quiz: Tangents, systems of equations, law of cosines

#### Calculator practice H

1. A cubic function  $f(x) = -x^3 + 3x^2 + x - 4$  is shown on the axes below.



A tangent to the function at  $x = 2$  is drawn with the point of tangency  $P$ .

- Write down the derivative of the function,  $f'(x)$ . [2]
- Show that the gradient of the tangent line is 1. [1]
- Find the equation of the tangent line. [2]
- Write down the slope of the perpendicular to the tangent line (the "normal") [1]
- Find the  $x$  values of
  - the local minimum and
  - the local maximum of  $f$ . [2]

Working:

$$b) f'(x) = -3x^2 + 6x + 1$$

$$= 1$$

$$c) f(2) = -2^3 + 3(2^2) + 2 - 4$$

$$= 2$$

$$e) -0.15470056...$$

$$2.1547$$

Answers:

$$(a) f'(x) = -3x^2 + 6x + 1$$

$$(c) y - 2 = 1(x - 2)$$

$$(d) -1$$

$$(e)(i) -0.155$$

$$(ii) 2.15$$

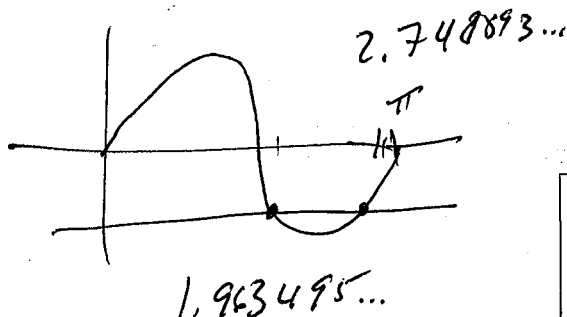
2. The function  $\sin 2x$  equals  $-\frac{\sqrt{2}}{2}$  twice in each period. Set your calculator for radians, and find the solutions for the system ( $x$  such that  $f(x) = g(x)$ ) over the domain  $0 \leq x \leq \pi$ . Sketch the graph to show working.

$$f(x) = \sin 2x$$

$$g(x) = -\frac{\sqrt{2}}{2}$$

[2]

Working:



Answers:

(a) 1.96

(b) 2.75

3. Apply the law of cosines,  $c^2 = a^2 + b^2 - 2ab \cos C$ ;  $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$ .

(a)  $a = 12.3$ ,  $b = 14.6$ ,  $\hat{C} = 62^\circ$ . Find the third side length,  $c$ .

[3]

(b)  $a = 15.4$ ,  $b = 11.1$ ,  $c = 10.1$ . Find  $\hat{C}$  (the angle opposite side  $c$ ).

[3]

Working:

a)  $c^2 = 12.3^2 + 14.6^2 - 2(12.3)(14.6) \cos 62$

$$c = \sqrt{195.834...}$$

$$= 13.99409...$$

b)  $\cos C = \frac{15.4^2 + 11.1^2 - 10.1^2}{2(15.4)(11.1)}$

$$= 0.7557...$$

$$C = 40.91305...$$

Answers:

(a) 14.0

(b) 40.9°