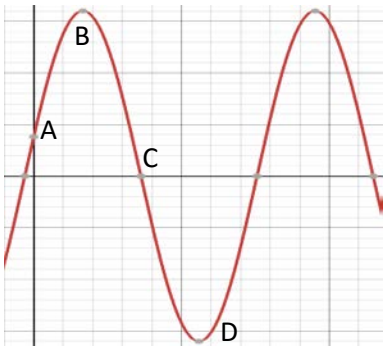
Engineering Maths Tutorial 14 (Elec)

1. Solve the following trigonometric equations for *x* between 0 and 2π $(0 \leq x \leq 2\pi)$
   a) $16 = 12 + 6\cos(x + 0.02)$
   b) $5 = 7 + 10\sin(2x - 0.16)$

2. The graph drawn below is of $y = 3.2\sin(4x + 0.24)$. Find the coordinates of *A*, *B*, *C* and *D*.



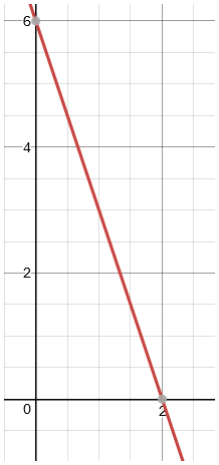
3. Find the maxima and minima of the curve $y = x^4 - 4x$

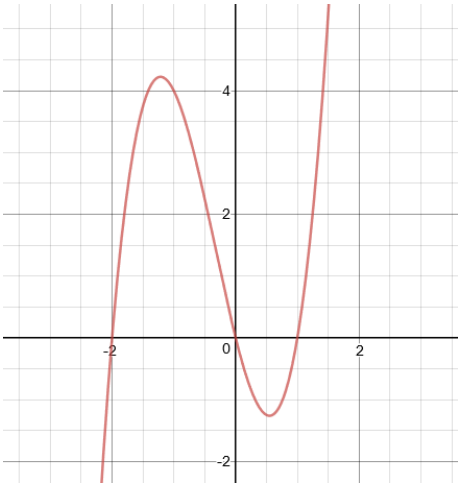
4. Find the turning points of $y = e^{2x} - 2x$ and state their nature.

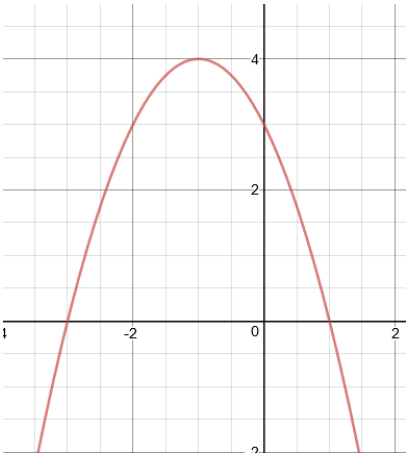
5. Find the equation of the tangent to $y = \sin(x)$ at the point where $x = \frac{\pi}{6}$

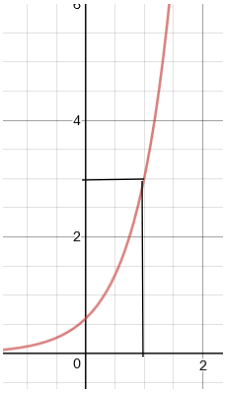
6. Find the equation of the tangent to $y = 3\ln(2x)$ at the point where $x = e^2$.

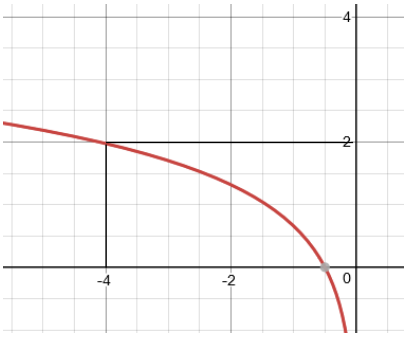
7. Find the equation of each graph below

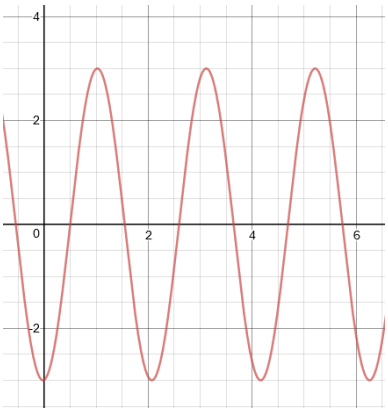












8. Find the area between $y = 16 - x^2$ and the *x*-axis.
9. Find the area between $y = \sqrt{x}$ and $y = x^2$.
10. Find the mean value of $y = 2 + 5x^4$ between $x = 0$ and $x = 3$.
11. A box has a volume of 100 cm^2. If it has a square base, what dimensions give the box its maximum surface area? (Assume this box has a top). What is this maximum area?
12. An object is dropped from the top of the Sky Tower. The height of the object as a function of time is given by $s(t) = 328 - 4.9t^2$.
    a) How high is the Sky Tower?
    b) How high is the object after 3 seconds?
    c) How long does it take the object to land?
    d) Find an expression for the velocity of the object
    e) How fast is it falling after 3 s?
    f) What is the acceleration of the onject?