EXAM I Name_____

1. When a camera flash goes off, the batteries immediately begin to recharge the flash's capacitor, which stores electric charge given by

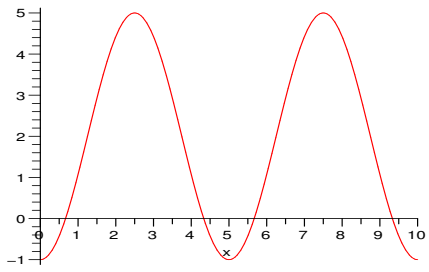
$$Q(t) = Q_0(1 - e^{-t/2})$$

   (a) Determine the maximum charge capacity?

   (b) How long does it take to recharge the capacitor to 90% of capacity?

   (c) Determine the inverse of this function.

2. Give a trigonometric equation that best describes the graph below.



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3. A boy runs along a straight line with constant speed. If you first see him at the point $A(-2, 3)$ and one second later he is at $B(5, 7)$ give parametric equtions that spot the boy's position at time t.

4. The position of a body at time t along a linear path can be determined by $s(t) = 4t - t^2$, $t \geq 0$.

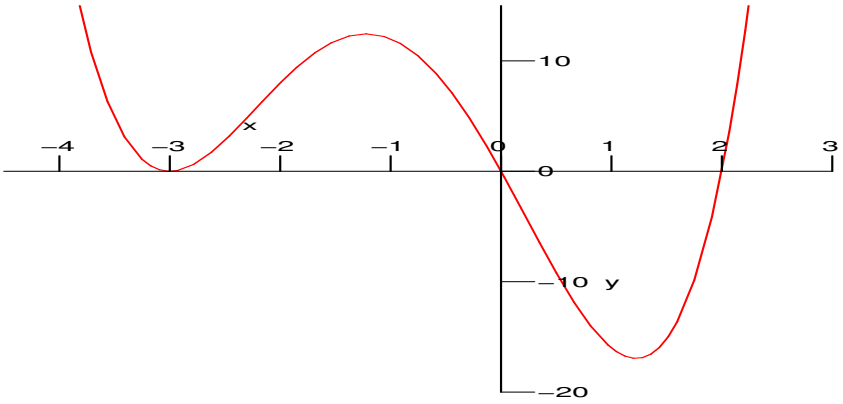
   (a) Determine the average velocity of the body from $t = 3$ to $t = 3 + h$.

   (b) Determine the average velocity of the body on $[2.75, 3]$.

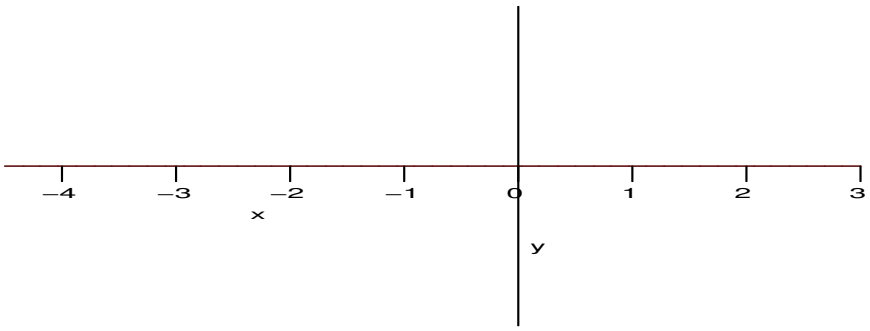
   (c) Determine the instantaneous velocity of the body at time $t = 4$.

   (d) If this position at time t is graphed, give the equation of the tangent line to the graph at $t = 3$.

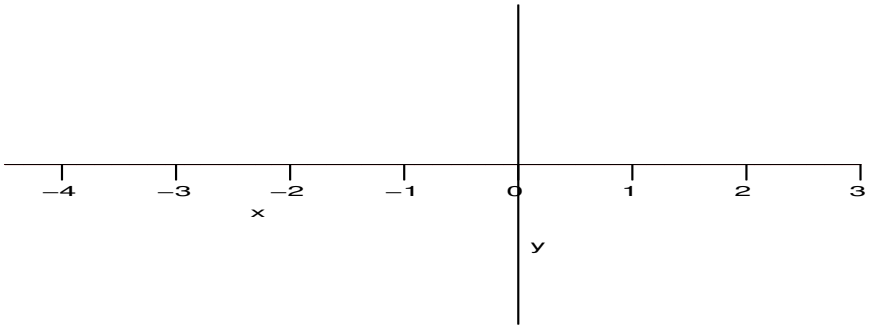
5. The graph of the derivative $f'(x)$ is shown below.



(a) Sketch a possible detailed graph of $f(x)$



(b) Sketch a possible detailed graph of $f''(x)$



6. Determine the limits

$$\lim_{h\to 0}\frac{e^h-1}{h}= \qquad\qquad \lim_{x\to 2}\frac{x^2-x-2}{x-2}=$$

7. Calculate the derivative of each of the following functions.

(a) $f(x)=4x^5-3x-2^x+5\sqrt{x}+\dfrac{2}{x^3}$

(b) $y=\dfrac{2e^x}{x^2-4}$

(c) $v(x)=\dfrac{\sqrt{x}+x^2}{x}$

(d) $s(t)=3^t t^3$