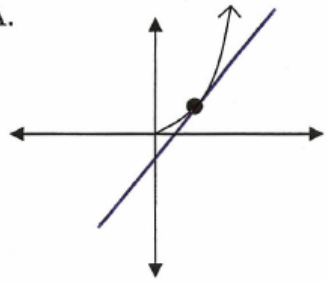
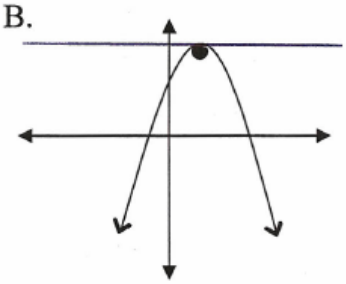
Math 11 **Instantaneous Rate of Change – "IROC"**

1. Draw the tangent line at the given point to show the slope at that point.

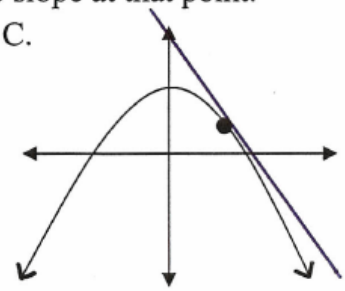
A.



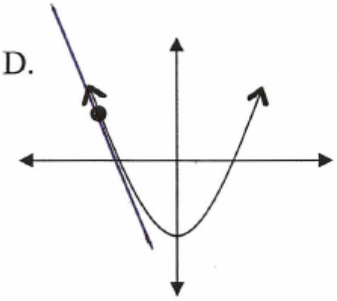
B.



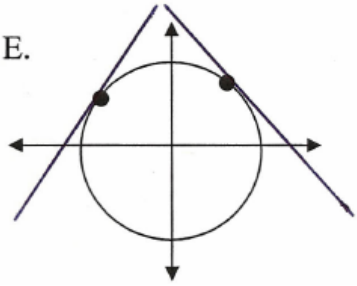
C.



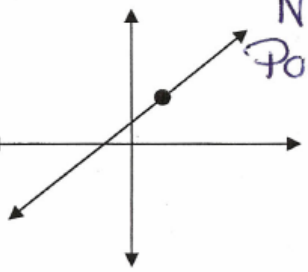
D.



E.



F.



NOT POSSIBLE!

2. Find the instantaneous rate of change for the given point indicated.

A. $y = 2x^2 + 3$ at $x = 4$

Hint: $(x_1, y_1) = (3.9, 33.42)$

$(x_2, y_2) = (4.1, 36.62)$

$y = 2(3.9)^2 + 3$
$= 2(15.21) + 3$
$= 30.42 + 3$
$= 33.42$

$y = 2(4.1)^2 + 3$
$= 2(16.81) + 3$
$= 33.62 + 3$
$= 36.62$

$IROC = \frac{y_2 - y_1}{x_2 - x_1}$
$= \frac{36.62 - 33.42}{4.1 - 3.9}$
$= \frac{3.2}{0.2}$
$= 16$

B. $y = x^2 - 2x + 3$ at $x = 1$

$y = (0.9)^2 - 2(0.9) + 3$
$y = 0.81 - 1.8 + 3$
$y = 2.01$
$(0.9, 2.01)$

$y = (1.1)^2 - 2(1.1) + 3$
$y = 1.21 - 2.2 + 3$
$y = 2.01$
$(1.1, 2.01)$

$IROC = \frac{y_2 - y_1}{x_2 - x_1}$
$= \frac{2.01 - 2.01}{1.1 - 0.9}$
$= \frac{0}{0.2}$
$= 0$

C. $h = -2t^2 + 3t - 4$ at $t = 2$

$h = -2(1.9)^2 + 3(1.9) - 4$
$h = -2(3.61) + 5.7 - 4$
$h = -7.22 + 5.7 - 4$
$h = -5.52$
$(1.9, -5.52)$

$h = -2(2.1)^2 + 3(2.1) - 4$
$h = -2(4.41) + 6.3 - 4$
$h = -8.82 + 6.3 - 4$
$h = -6.52$
$(2.1, -6.52)$

$$IROC = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-6.52 - -5.52}{2.1 - 1.9} = \frac{-1}{0.2} = -5$$

D. $y = x^3 - 3$ at $x = 1$

$y = (0.9)^3 - 3$
$y = 0.729 - 3$
$y = -2.271$
$(0.9, -2.271)$

$y = (1.1)^3 - 3$
$y = 1.331 - 3$
$y = -1.669$
$(1.1, -1.669)$

$$IROC = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1.669 - -2.271}{1.1 - 0.9} = \frac{0.602}{0.2} = 3.01$$

E. $P = 2c^2 + 7c - 4$ at $c = -2$

$P = 2(-1.9)^2 + 7(-1.9) - 4$
$P = 2(3.61) - 13.3 - 4$
$P = 7.22 - 13.3 - 4$
$P = -10.08$
$(-1.9, -10.08)$

$P = 2(-2.1)^2 + 7(-2.1) - 4$
$P = 2(4.41) - 14.7 - 4$
$P = 8.82 - 14.7 - 4$
$P = -9.88$
$(-2.1, -9.88)$

$$IROC = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-9.88 - -10.08}{-2.1 - -1.9} = \frac{0.2}{-0.2} = -1$$