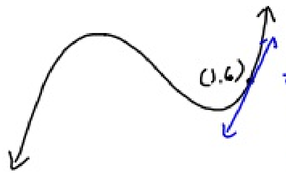
1-10-18 1st Trig



To find slope, we take the derivative.

① Find equation of tangent line to above line if it is $f(x) = x^3+3x+2$ and point is $(1,6)$.

$f'(x) = 3x^2+3$

$f'(1) = 3\cdot 1^2+3 = 6$

$m=6$ $(1,6)$

$y-y_1 = m(x-x_1)$

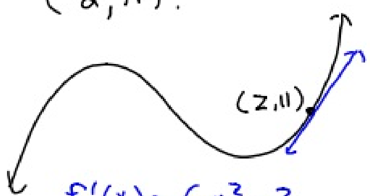
$y-6 = 6(x-1)$

$y-6 = 6x-6$

$+6 \quad\quad +6$

$y = 6x$

② Give the equation of the line tangent to $f(x) = 2x^3-3x+1$ at $(2,11)$.



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

$f'(2) = 6\cdot 2^2-3 = 21$

$m=21$ $(2,11)$

$y-y_1 = m(x-x_1)$

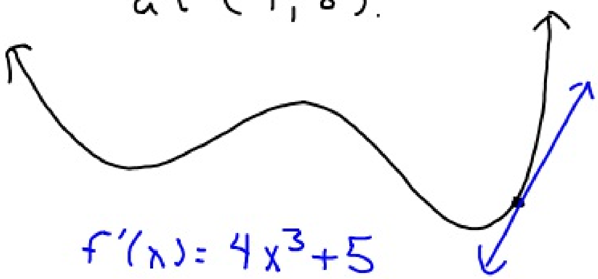
$y-11 = 21(x-2)$

$y-11 = 21x-42$

$+11 \quad\quad +11$

$y = 21x-31$

③ Give the equation of the line tangent to $f(x) = x^4 + 5x + 2$ at $(1,8)$.



$f'(x) = 4x^3 + 5$

$f'(1) = 4 \cdot 1^3 + 5 = 9$

$m = 9 \quad (1,8)$

$y - y_1 = m(x - x_1)$

$y - 8 = 9(x - 1)$

$$\begin{array}{rcl} y - 8 &=& 9x - 9 \\ +8 & & +8 \\ \hline y &=& 9x - 1 \end{array}$$

④ Give the equation of the line tangent to $f(x) = 4x^3 - 3x^2 + 1$ at $(2,21)$.

$f'(x) = 12x^2 - 6x$

$f'(2) = 12 \cdot 2^2 - 6 \cdot 2 = 36$

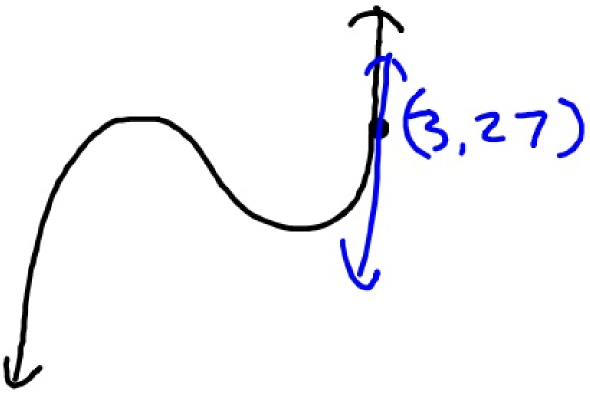
$m = 36 \quad (2,21)$

$y - y_1 = m(x - x_1)$

$y - 21 = 36(x - 2)$

$$\begin{array}{rcl} y - 21 &=& 36x - 72 \\ +21 & & +21 \\ \hline y &=& 36x - 51 \end{array}$$

⑤ Give the equation of the line tangent to $y = x^3$ at the point $(3, 27)$.



$f'(x) = 3x^2$

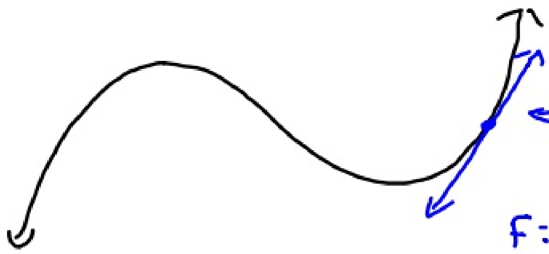
$f'(3) = 3 \cdot 3^2 = 27$

$m = 27 \qquad (3, 27)$

$y - 27 = 27(x - 3)$

$$\begin{array}{r} y - 27 = 27x - 81 \\ +27 \qquad\qquad\quad +27 \\ \hline y = 27x - 54 \end{array}$$

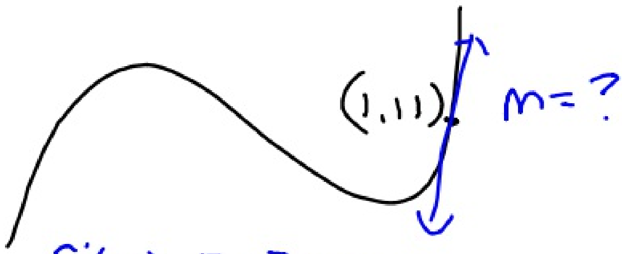
1-10-18 3rd Trig



find slope by taking the derivative of equation

① Find the equation of the line tangent to

$f(x) = x^3 + 6x^2 + 4$ at $(1, 11)$.



$f'(x) = 3x^2 + 12x$

$f'(1) = 3 \cdot 1^2 + 12 \cdot 1 = 15$

$m = 15 \quad (1, 11)$

$y - y_1 = m(x - x_1)$

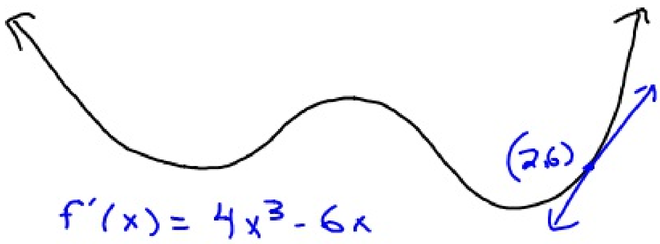
$y - 11 = 15(x - 1)$

$y - 11 = 15x - 15$

$\underline{\;+11 \qquad\qquad +11\;}$

$y = 15x - 4$

(2) Give the equation of the line tangent to
$f(x) = x^4 - 3x^2 + 2$ at $(2,6)$.



$f'(x) = 4x^3 - 6x$

$f'(2) = 4 \cdot 2^3 - 6 \cdot 2 = 20$

$m = 20 \quad (2,6)$

$y - y_1 = m(x - x_1)$

$y - 6 = 20(x - 2)$

$y - 6 = 20x - 40$
$\quad +6 \qquad\quad +6$

$y = 20x - 34$

(3) Give the equation of the line tangent to
$f(x) = x^3 - 6$ at $(2,2)$.

$f'(x) = 3x^2$

$f'(2) = 3 \cdot 2^2 = 12$

$y - y_1 = m(x - x_1)$

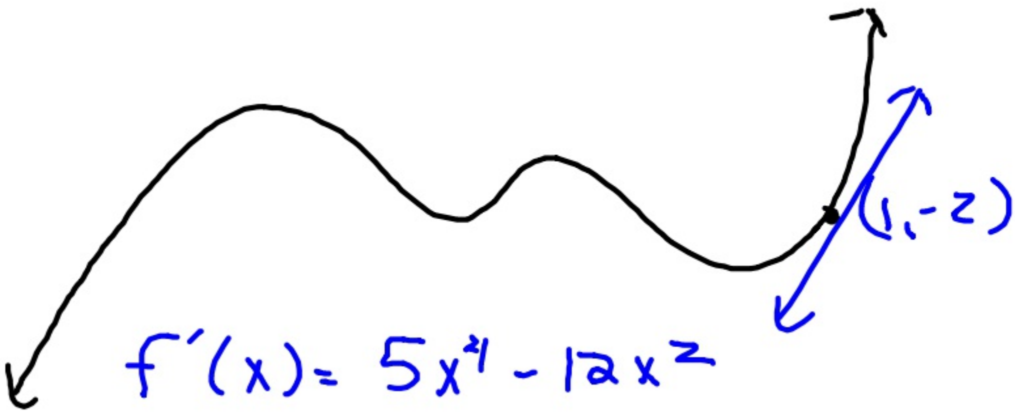
$y - 2 = 12(x - 2)$

$y - 2 = 12x - 24$
$\quad +2 \qquad\quad +2$

$y = 12x - 22$

(4) Give the equation of the tangent line to

$f(x) = x^5 - 4x^3 + 1$ at $(1,-2)$



$f'(x) = 5x^4 - 12x^2$

$f'(1) = -7 \qquad (1,-2)$

$y - y_1 = m(x - x_1)$

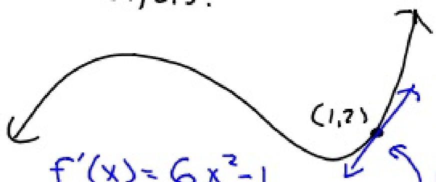
$y - -2 = -7(x - 1)$

$$\begin{aligned} y + 2 &= -7x + 7 \\ -2 & \qquad\quad -2 \\ \hline y &= -7x + 5 \end{aligned}$$

1-10-18 4th Trig

tangent line
the derivative of the equation tells us its SLOPE at that point

① Give the equation the line tangent to $f(x) = 2x^3 - x + 1$ at $(1,2)$.



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

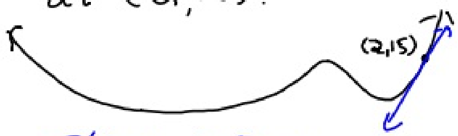
$f'(1) = 6 \cdot 1^2 - 1 = 5$

$m = 5$

$m = 5 \quad (1,2)$

$$y - y_1 = m(x - x_1)$$
$$y - 2 = 5(x - 1)$$
$$y - 2 = 5x - 5$$
$$\underline{+2 \qquad +2}$$
$$y = 5x - 3$$

② Give the equation of the tangent line to $f(x) = x^4 - x + 1$ at $(2,15)$.



$f'(x) = 4x^3 - 1$

$f'(2) = 4 \cdot 2^3 - 1 = 31$

$m = 31 \quad (2,15)$

$$y - y_1 = m(x - x_1)$$
$$y - 15 = 31(x - 2)$$
$$y - 15 = 31x - 62$$
$$\underline{+15 \qquad +15}$$
$$y = 31x - 47$$

(3) Give the equation of the tangent line to $f(x) = -3x^3 + 2x^2 - 1$ at $(1, -2)$.

$f'(x) = -9x^2 + 4x$

$f'(1) = -9 \cdot 1^2 + 4 \cdot 1 = -5$

$m = -5 \quad (1, -2)$

$y - y_1 = m(x - x_1)$

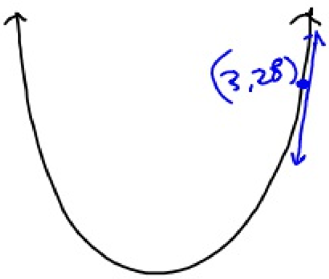
$y - -2 = -5(x - 1)$

$y + 2 = -5x + 5$

$\underline{\;\;-2 \qquad\qquad -2\;\;}$

$y = -5x + 3$

(4) Give the equation of the line tangent to $f(x) = x^2 + 6x + 1$ at $(3, 28)$.



$f'(x) = 2x + 6$

$f'(3) = 2 \cdot 3 + 6 = 12$

$m = 12 \quad (3, 28)$

$y - 28 = 12(x - 3)$

$y - 28 = 12x - 36$

$\underline{\;\;+28 \qquad\qquad +28\;\;}$

$y = 12x - 8$