Difference Quotient

The difference Quotient is a formula that will help us to find the slope of a curve at any given point.

$$\text{difference quotient} = \frac{f(x+h) - f(x)}{h}$$

Where f(x) is a function, and h represents the change in x, (Δx).

Later we will find the instantaneous slope at a point by letting h become infinitesimally small and approach zero.

$$\frac{f(x+h)-f(x)}{h}$$

1) $f(x) = 3x - 8$

find the diff. quotient & the slope of f(x) at any point

$$\frac{[3(x+h)-8]-[3x-8]}{h}$$

$$\frac{\cancel{3x}+3h\cancel{-8}\cancel{-3x}\cancel{+8}}{h} = \frac{3h}{h} = 3$$

2) $f(x) = 5x^2 - 2x + 11$

$$\frac{[5(x+h)^2-2(x+h)+11]-[5x^2-2x+11]}{h}$$

$$5(x^2+2xh+h^2)-2x-2h+11-5x^2+2x-11$$

$$\cancel{5x^2}+10xh+5h^2\cancel{-2x}-2h\cancel{+11}\cancel{-5x^2}\cancel{+2x}\cancel{-11}$$

$$\frac{10xh+5h^2-2h}{h}$$

$$\boxed{10x+5h-2}$$

3) $g(x) = 4x - x^2 + 6$

$$\frac{f(x+h)-f(x)}{h}$$

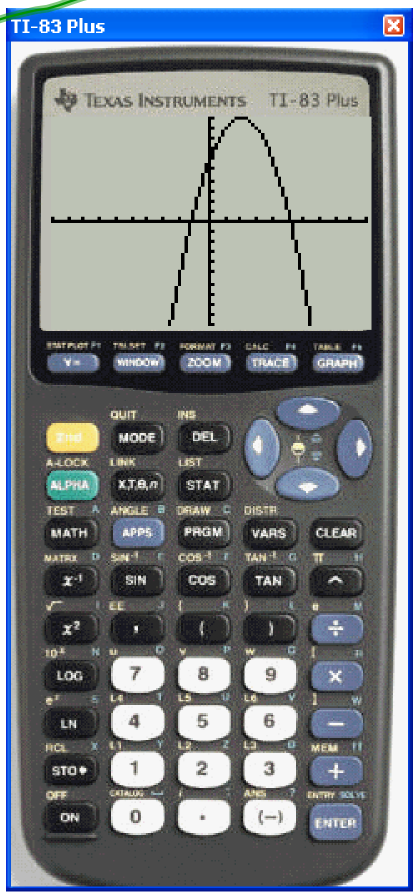
find diff. quotient

$$-2x - h + 4$$

$$\frac{4(x+h) - (x+h)^2 + 6 - (4x - x^2 + 6)}{h}$$

$$\cancel{4x} + 4h - \cancel{x^2} - 2xh - h^2 \cancel{+6} - \cancel{4x} + \cancel{x^2} - \cancel{6}$$

$$= \frac{4h - 2xh - h^2}{h} = \boxed{4 - 2x - h}$$



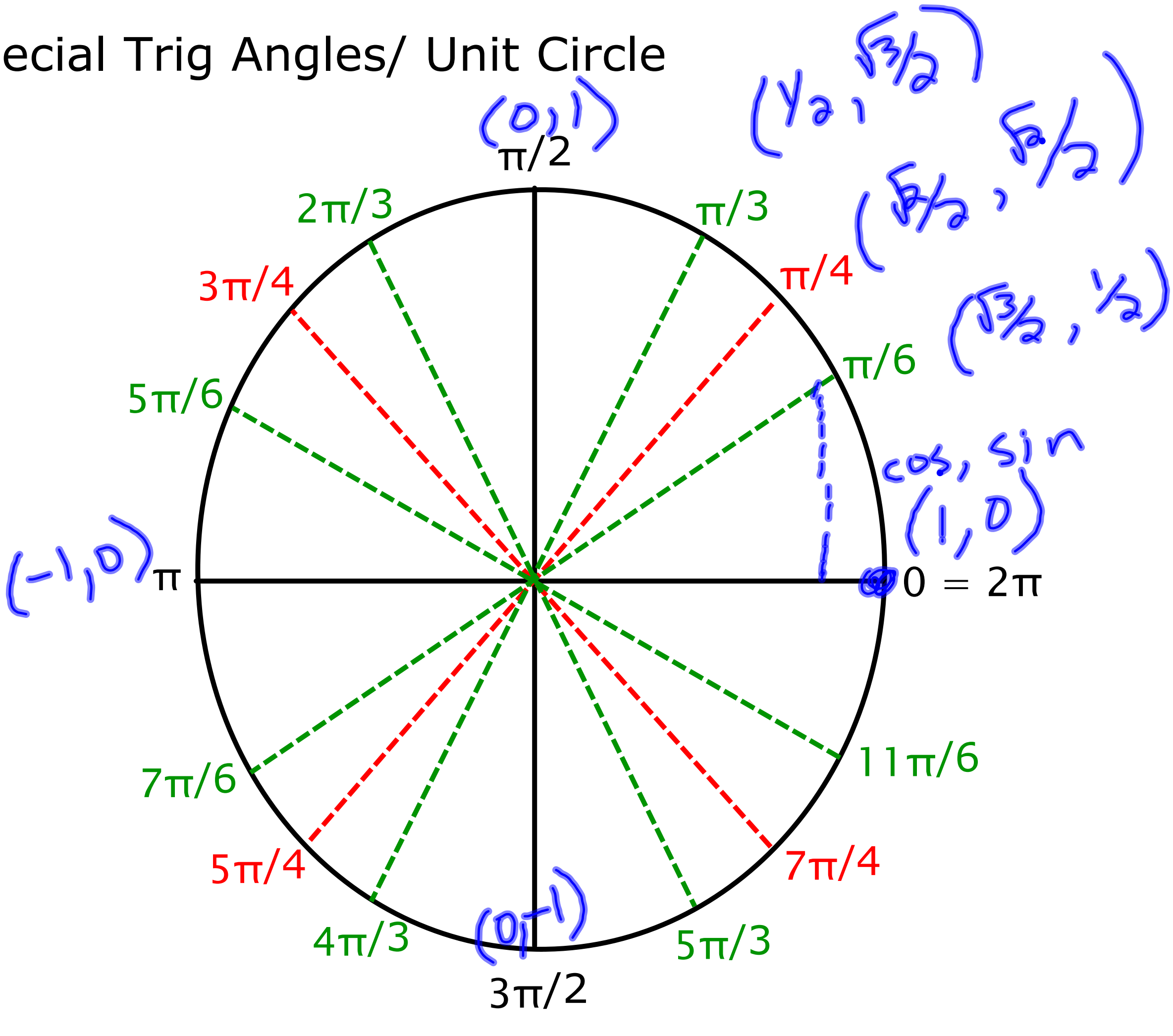
find slope at x = -1, 2, and 4

$x = -1$
$m = 4 - 2(-1) - 0 = 6$

$x = 2$
$m = 4 - 2(2) - 0$
$= 0$

$x = 4$
$m = -4$

Special Trig Angles/ Unit Circle



Calculate:

1) $\sin(19\pi/6) = \sin\left(3\tfrac{1}{6}\pi\right) = \sin\left(7\pi/6\right) = -\frac{1}{2}$

2) $\tan(7\pi/3) = \tan(\pi/3) = \sqrt{3}$

3) $\sec(11\pi/4) = \sec(3\pi/4) = \dfrac{1}{\cos(3\pi/4)} = -\sqrt{2}$

4) $f(x) = \sin^2x + 3\cos x - 2$
find $f(0)$, $f(\pi/2)$, $f(3\pi)$, $f(2\pi/3)$

$$f(0) = \sin^2(0) + 3\cos 0 - 2 = 0 + 3 - 2 = 1$$

$$f(\pi/2) = \sin^2(\pi/2) + 3\cos\pi/2 - 2 = -1$$
$$1 + 0 - 2$$

$$f(3\pi) = \sin^2(3\pi) + 3\cos(3\pi) - 2 = -5$$
$$0 + 3(-1) - 2$$

$$f(2\pi/3) = \sin^2(2\pi/3) + 3\cos(2\pi/3) - 2 = -\frac{11}{4}$$
$$\left(\frac{\sqrt{3}}{2}\right)^2 + 3\left(-\frac{1}{2}\right) - 2$$
$$\frac{3}{4} - \frac{3}{2} - 2$$
$$\frac{3}{4} - \frac{6}{4} - \frac{8}{4} = -\frac{11}{4}$$