

## Pre Calc Midterm Review Game

### • Function Basics

$$\begin{aligned}100: f(-4) &= \sqrt{(-4)^2 - 5(-4)} \\ &= \sqrt{16+20} \\ &= \sqrt{36} \\ &= \boxed{6}\end{aligned}$$

$$200: f(x) = \frac{x+3}{4} \Rightarrow y = \frac{x+3}{4} \Rightarrow \frac{x}{1} = \frac{y+3}{4}$$

$$\Rightarrow 4x = y+3$$

$$y = 4x-3 \Rightarrow \boxed{f^{-1}(x) = 4x-3}$$

$$300: f(-x) = (-x)^2 - 2(-x)^2 + (-x) - 3$$

$$= -x^2 - 2x^2 - x - 3 \Rightarrow \boxed{\text{neither}}$$

$$400: \left(\frac{f}{g}\right)(x) = \frac{x^2-9x}{x^2-5x-36} = \frac{x(x/9)}{(x-4)(x+4)} = \boxed{\frac{x}{x+4}}$$

$$500: -4x - 2a \geq 0$$

$$-4x \geq 2a$$

$$x \leq \frac{-2a}{4}$$

$$x \leq \frac{-1}{2}a \Rightarrow \boxed{\left[-\frac{1}{2}a, \infty\right)}$$

### • Graphing Basics

$$100: \text{Period} = \frac{2\pi}{b} = \frac{2\pi}{\pi} = \boxed{2}$$

$$200: \text{Increasing: } (1, \infty)$$

$$\text{Decreasing: } (-\infty, -1)$$

$$\text{Constant: } (-1, 1)$$

$$300: a=4, d=-a, \text{Period}=\pi$$

$$\Rightarrow \boxed{y = 4\sin(2x) - 2}$$

$$\frac{\pi}{1} = \frac{2\pi}{b} \Rightarrow \frac{1}{\pi}b = \frac{2\pi}{\pi} \Rightarrow b=2$$

Daily double:  $f(x) = \frac{x^2 + x - 6}{x^2 - 4} = \frac{(x+3)(x/2)}{(x+2)(x-2)} = \frac{x+3}{x+2}$

Hole:  $x=2$

y-value:  $\frac{2+3}{2+2} = \frac{5}{4} \Rightarrow \boxed{(2, 5/4)}$

500: Horizontal: None; num > denom

Vertical:  $x-1=0$

$x=1$

slant:  $\begin{array}{c|ccc} 1 & 1 & 8 & -20 \\ & \downarrow & 1 & 9 \\ & 1 & 9 & -11 \end{array} \quad y = x+9$

Logarithms

100:  $\log_2 \left( \frac{1}{64} \right) = x$

$2^x = \frac{1}{64} \Rightarrow 2^x = 2^{-6} \Rightarrow \boxed{x = -6}$

200:  $\ln_e x = 5 \Rightarrow e^5 = x$

$x \approx \boxed{148.4132}$

300:  $\log_3 (2x^4 \sqrt{y}) = \log_3 2 + \log_3 x^4 + \log_3 \sqrt{y}$

$= \log_3 2 + 4 \log_3 x + \log_3 y^{1/2} = \boxed{\log_3 2 + 4 \log_3 x + \frac{1}{2} \log_3 y}$

400:  $\log (6x+2) - \left( \frac{1}{3} \log y + 2 \log z \right) = \log (6x+2) - (\log y^{1/3} + \log z^2)$

$= \log (6x+2) - \log \sqrt[3]{y} z^2$

$= \boxed{\frac{\log (6x+2)}{\sqrt[3]{y} z^2}}$

500:  $\log_{10} (5x+15) = 3$

$10^3 = 5x+15$

$1000 = 5x+15$

$985 = 5x \Rightarrow \boxed{x = 197}$

### All About Angles

$$100: -\frac{2\pi}{3} + \frac{2\pi}{1} = -\frac{2\pi}{3} + \frac{4\pi}{3} = \boxed{\frac{4\pi}{3}}$$

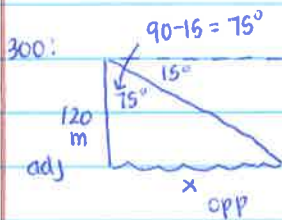
$$200: s = ?, r = 4 \text{ in}, \theta = 240^\circ = \frac{4\pi}{3}$$

$$\frac{240}{1} \cdot \frac{\pi}{180} = \frac{240\pi}{180} = \frac{4\pi}{3}$$

$$\Rightarrow s = \theta r$$

$$s = \frac{4\pi}{3} (4)$$

$$s = \frac{16\pi}{3} \approx \boxed{16.8 \text{ inches}}$$



$$\tan(75^\circ) = \frac{x}{120} \Rightarrow x = 120 \cdot \tan(75^\circ)$$

$$x = 447.8 \text{ m}$$

The boat is 447.8 m away

Daily Double:  $x=2, y=-1, r=?$

$$r = \sqrt{x^2 + y^2}$$

$$r = \sqrt{(2)^2 + (-1)^2}$$

$$r = \sqrt{4+1}$$

$$r = \sqrt{5}$$

$$\csc \theta = \frac{r}{y} = \frac{\sqrt{5}}{-1} = \boxed{-\sqrt{5}}$$

$$500: \frac{17\pi}{6} - \frac{2\pi}{1} = \frac{17\pi}{6} - \frac{12\pi}{6} = \frac{5\pi}{6} \leftarrow \text{coterminal angle}$$

$$\text{Reference angle} = \pi - \theta$$

$$= \frac{\pi}{1} - \frac{5\pi}{6} = \frac{6\pi}{6} - \frac{5\pi}{6} = \boxed{\frac{\pi}{6}}$$

### Miscellaneous

$$100: \frac{-6}{1} \cdot \frac{180}{\pi} = -\frac{1080}{\pi} = -343.8^\circ$$

Quadrant I

$$-343.8 + 360 = 16.2^\circ \leftarrow \text{coterminal angle}$$

$$200: \frac{16 \text{ mph}}{1} \cdot \frac{1 \text{ deg}}{60 \text{ mph}} = 0.25^\circ$$

$$30.2639^\circ$$

$$\frac{50 \text{ sec}}{1} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = \frac{0.8333 \text{ min}}{1} \cdot \frac{1 \text{ deg}}{60 \text{ min}} = .0139$$

$$300: \sin \theta = \frac{-5}{6} \Rightarrow y = -5, r = 6, x = ?$$

$$b = \sqrt{x^2 + (-5)^2}$$

$$b = \sqrt{x^2 + 25}$$

$$36 = x^2 + 25$$

$$11 = x^2$$

$$x = \sqrt{11}$$

$x = -\sqrt{11}$  in Quad III

$$\cos \theta = \frac{x}{r} = \frac{-\sqrt{11}}{6}$$

$$400: -510^\circ + 360 = -150^\circ + 360 = 210^\circ \left( -\frac{\sqrt{3}}{2}, -\frac{1}{2} \right)$$

$$\sin(-510^\circ) = -\frac{1}{2}$$

$$\cos(-510^\circ) = -\frac{\sqrt{3}}{2}$$

$$\tan(-510^\circ) = -\frac{1}{2} \div -\frac{\sqrt{3}}{2} = -\frac{1}{2} \cdot -\frac{2}{\sqrt{3}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

$$500: \log x + \log(x-3) = 1$$

$$\log x(x-3) = 1$$

$$\log_{10} x^2 - 3x = 1$$

$$10^1 = x^2 - 3x$$

$$10 = x^2 - 3x$$

$$0 = x^2 - 3x - 10$$

$$0 = (x-5)(x+2)$$

$$x = 5, x = -2$$

check:

$$\log(5) + \log(5-3) = 1$$

$$\log(5) + \log(2) = 1 \quad (\checkmark)$$

$$\log(-2) + \log(-2-3) = 1$$

$$\log(-2) + \log(-5) = 1 \quad (\times)$$

cant have negatives in original

Final:

$$\text{Sitka, Alaska: } \frac{03 \text{ min}}{1} \cdot \frac{1 \text{ deg}}{60 \text{ min}} = .05 \text{ degree} \Rightarrow 57.05^\circ$$

$$\text{Whitehorse, Canada: } \frac{43 \text{ min}}{1} \cdot \frac{1 \text{ deg}}{60 \text{ min}} = .7167 \Rightarrow 60.7167^\circ$$

$$\text{Difference in latitudes: } 60.7167 - 57.05 = 3.667^\circ \cdot \frac{\pi}{180} = .0639 \text{ radians}$$

$$s = r\theta$$

$$s = (.0639)(4000)$$

$$s = 255.6$$

⇒ The distance between the cities is 255.6 miles