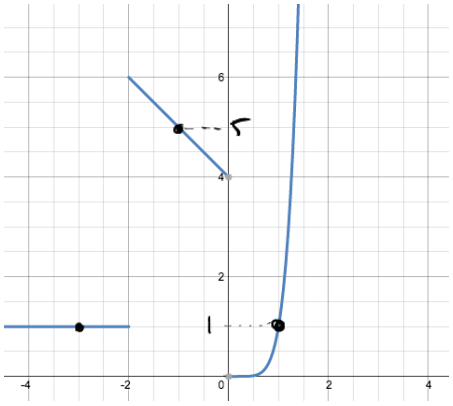
Exam 1 :: Math 271 :: February 7, 2017

1.



The graph of a function $f(x)$ is shown.

Compute $f(-2)$ 1

If $g(x) = f(x) - 1$, compute $g(1)$ 0

If $h(x) = f(x+1)$, compute $h(-2)$ 5

If $k(x) = 3 \cdot f(2x+1) + 3$, compute $k(-2)$ 6

2. In thermal resistance applications, one encounters the following expression. Solve for T_2

$$R = \frac{A(T_2 - T_1)}{H}$$

$$\frac{HR}{A} = \frac{A(T_2 - T_1)}{A}$$

$$\frac{HR}{A} = T_2 - T_1 \Rightarrow$$

$$T_2 = \frac{HR}{A} + T_1$$

3. Simplify

$$\frac{-16N^{-2}(NT^2)}{-2N^0T^{-1}}$$

$N^0 = 1$

since no +/-

$$\frac{8N^{-2}(NT^2)}{N^0T^{-1}} = \frac{8N^{-2}NT^2}{T^{-1}} = 8N^{-1}T^2T^1$$

$$\frac{8T^3}{N}$$

4. The circumference of a basketball is about 29.8 in. Use the formulas below to compute the volume of a basketball.

The volume of a sphere is $V = \frac{4\pi r^3}{3}$.

The circumference of a circle is $C = 2\pi r$.

$C = 2\pi r = 29.8$

$r = \frac{29.8}{2\pi} = 4.74$

$V = \frac{4\pi (4.74)^3}{3}$

$\approx 446 \text{ in}^3$

5. Simplify the expression completely.

$$\frac{3(x+h)^2 - 3x^2}{h} = \frac{3(x^2 + 2xh + h^2) - 3x^2}{h}$$

$$= \frac{3x^2 + 6xh + 3h^2 - 3x^2}{h} = \frac{6xh + 3h^2}{h}$$

$$6x + 3h$$

6. Simplify

$$\frac{\frac{x+y}{xy}}{\frac{y}{x} - \frac{x}{y}} \cdot \frac{\frac{y}{y}\frac{x}{x}}{\frac{y}{y}\frac{x}{x}} = \frac{\frac{x+y}{xy}}{\frac{y^2 - x^2}{yx}} = \frac{x+y}{xy} \cdot \frac{yx}{y^2 - x^2} = \frac{x+y}{y^2 - x^2} = \frac{y+x}{(y-x)(y+x)}$$

$$= \boxed{\frac{1}{y-x}}$$

8 a.m. $\longleftrightarrow$ $t=0$ & $n=$
10 a.m. $\longleftrightarrow$ $t=2$ & $n=1800$
2 p.m. $\longleftrightarrow$ $t=6$ & $n=600$

7. An oil-storage tank is emptied at a constant rate. At 10 a.m. 1800 barrels remain, and at 2 p.m. 600 barrels remain. If pumping started at 8 a.m. find the equation relating the number of barrels n at time t (in hours) from 8 a.m.. When will the tank be empty?

Two points: $(2,1800)$, $(6,600)$ $\quad m = \dfrac{1800-600}{2-6} = \dfrac{1200}{-4} = -300$ barrels/hour

$y = mx + b$

$600 = -300(6) + b$

$2400 = b$

$$\boxed{y = -300x + 2400}$$

4 pm

8. Determine whether the lines through the two pairs of points are parallel, perpendicular or neither.

$(-1,-4)$ and $(2,3)$; $(-5,2)$ and $(-19,8)$

slope slope

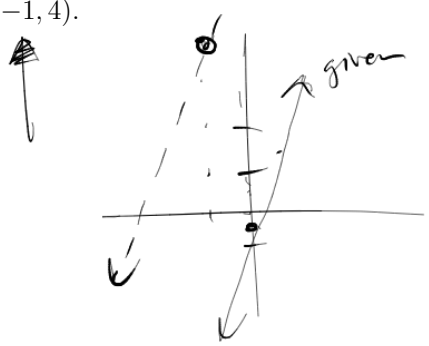
$\dfrac{3-(-4)}{2-(-1)} = \boxed{\dfrac{7}{3}}$ $\qquad \dfrac{8-2}{-19+5} = \dfrac{6}{-14} = \boxed{\dfrac{3}{-7}}$

negative reciprocals

perp!

$m=2$

9. Find the equation of the line that is parallel to the line given by $4x-2y=1$ and which contains the point $(-1,4)$.



extract slope $\longrightarrow y = mx+b$

$4x-1=2y$ $\qquad m=2$!

$2x-\frac{1}{2}=y$

$y = mx+b$

$4 = 2(-1)+b$

$6=b$

$$\boxed{y=2x+6}$$

signs different $\Rightarrow x^2 - 25$

10. Factor the expression below completely.

$$nx - 5n - x^2 + 25$$

group $n(x-5) - 1(x^2-25)$

$n(x-5) - (x-5)(x+5)$

$(x-5)(n - (x+5))$

$(x-5)(n-x-5)$

11. Perform the indicated operations and simplify.

$$\frac{x}{2x-6} + \frac{1}{4} - \frac{3x}{4x-12}$$

factor downstairs to reveal common denom

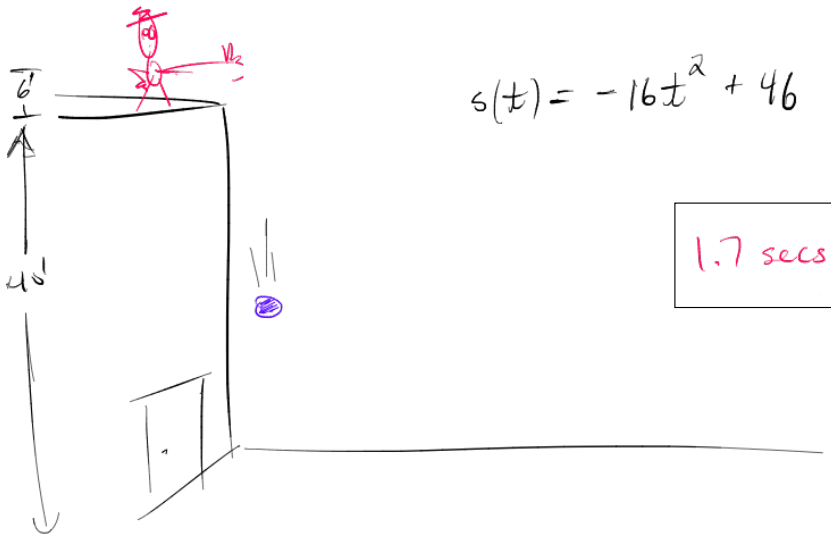
$\frac{2 \cdot x}{2 \cdot 2(x-3)} + \frac{1(x-3)}{4(x-3)} - \frac{3x}{4(x-3)}$

$\frac{2x + x - 3 - 3x}{4(x-3)}$ (3x)

$\frac{-3}{4(x-3)}$

12. So far, this class is _____

Position of small rock dropped from a building 40' high, counting the 6 feet dropper. (position vs. time)



$s(t) = -16t^2 + 46$

1. when will it hit ground.

Height = $s(t)$ "y-value"

$\Rightarrow s(t) = 0 = -16t^2 + 46$

$16t^2 = 46$

$t^2 = 46/16$

$t = \pm\sqrt{46/16}$

± 1.7

1.7 secs (choose + answer)

2. with what speed will it hit ground. we need the derivative.

The average rate of change doesn't give an exact answer.

Approx: Find A.R. of C. of $s(t) = -16t^2 + 46$ on $[1.6, 1.7]$

≈ -52.8 ft/sec.

$s'(t) = -32t$ derivative

$s'(1.7) = -54.4$ ft/sec