GOOD LUCK!

Exam 1 Guide:: Math 271 :: February 3, 2017

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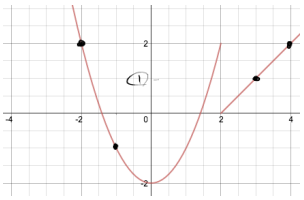
1. 

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

Compute $f(4) = 2$

If $g(x) = f(x) + 1$, compute $g(-2)$ $= f(-2)+1 = 3$
If $h(x) = f(x+1)$, compute $h(-2)$ $= f(-2+1) = f(-1) = -1$
If $k(x) = f(2x+1) - 1$, compute $k(1)$ $= f(2(1)+1) - 1$
$= f(3) - 1 = 1 - 1$
$= 0$

2. (a) Study: Chapter 1 Equations, p. 45
   (b) Study: Chapter 6 Equations, p. 211
   (c) Section 21.1, (33,35,37) 21.2 (1-15 odd)

3. In solar heating applications, one encounters the following expression. Solve for T_1

$$Q = \frac{kAt(T_2 - T_1)}{L} \Rightarrow LQ = kAt(T_2 - T_1) = kAtT_2 - kAtT_1$$

$$\frac{LQ - kAtT_2}{-kAt} = \frac{-kAtT_1}{-kAt} \Rightarrow \boxed{T_1 = \frac{LQ - kAtT_2}{-kAt}}$$

4. Solve for y.

$$5y - 2(y-4) = 7 \Rightarrow 3y + 8 = 7 \Rightarrow 3y = -1 \Rightarrow \boxed{y = -\frac{1}{3}}$$
$$5y - 2y + 8 = 7$$

5. Simplify

$$\frac{8a^3x^2 - 4a^2x^4}{-2ax^2} \qquad \frac{4a^2x^2(2a - x^2)}{-2ax^2} = \boxed{-2a(2a - x^2)}$$

6. During a rainstorm, 1.00 in. of rain fell. What weight of water fell on an area one square mile (1.00 mi^2)? Each cubic foot of water weighs 62.4 pounds.

$1\ mi^2 \times 1\ in = mi^2 \times \frac{5280^2\ ft^2}{1\ mi^2} \times 1\ \cancel{in} \times \frac{1\ ft}{12\ \cancel{in}}$

$\frac{5280^2}{12}\ ft^3 \cdot 62\ \frac{lbs}{\cancel{ft^3}} =$

roughly: 144 million pounds

7. (a) Simplify the expression completely.

1
1 1
1 2 1
1 3 3 1

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

also try: $\frac{\sqrt{x+h} - \sqrt{x}}{h}$

(b) Simplify

$$\frac{\frac{y}{y}\frac{y}{x} + \frac{x}{y}\frac{x}{x}}{\frac{x+y}{xy}} = \frac{\frac{y^2 + x^2}{yx}}{\frac{x+y}{xy}} = \frac{y^2 + x^2}{yx} \cdot \frac{xy}{x+y} = \boxed{\frac{y^2 + x^2}{x+y}}$$

sum of squares never factors

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

Find the eqn of line b/w two points.

$P = (0, 12)$, $Q = (6, 20)$ $\Rightarrow$ $m = \frac{\Delta y}{\Delta x} = \frac{20-12}{6-0} = \frac{8}{6} = \frac{4}{3}$ in/hr.

$y = mx + b$

$12 = \frac{4}{3}(0) + b$, $b = 12$

$\boxed{y = \frac{4}{3}x + 12}$

8. Assume snow is falling at a constant rate. During a storm we know that at noon the snow depth is 12 inches, and at 6pm the snow depth is 20 inches. If the storm continues at this rate, predict the depth of snow at 9pm.

@ 9pm, $x = 9$

$y = \frac{4}{3}(9) + 12 = 24$ inches

9. Find the equation of the line perpendicular to $y = 2x + 5$ that goes through the point $(-1, 4)$.

negative-reciprocal $m_\perp = -\frac{1}{2}$

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

plug in to find b

$4 = -\frac{1}{2}(-1) + b$

$b = 3.5$

$\boxed{y = -\frac{1}{2}x + 3.5}$

10. Find the equation of the line that passes through $(7, -2)$ and $(-1, 4)$.

$m = \frac{4-(-2)}{-1-7} = \frac{6}{-8} = -\frac{3}{4}$

$y = -\frac{3}{4}(x) + b$, now plug in $(7, -2)$

$-2 = -\frac{3}{4}(7) + b$

$-2 + \frac{21}{4} = -\frac{8}{4} + \frac{21}{4} = \frac{13}{4} = b$

$y = -\frac{3}{4}x + \frac{13}{4}$

check @ $(-1, 4)$

$4 = -\frac{3}{4}(-1) + \frac{13}{4}$

$\frac{16}{4} = \frac{3}{4} + \frac{13}{4}$ ✓ :)

11. Simplify the expression and eliminate any negative exponents:

$$\frac{b^{-1}(bd)^2 c}{(ab^{-1}d)^2 a^{-2} b a^{-1} b} = \frac{b^{-1} b^2 d^2 c}{a^2 b^{-2} d^2 a^{-2} b a^{-1} b} = \frac{b d^2 c}{a^2 a^{-2} b^{-2} b b d^2 a^{-1}}$$

$$= \frac{b c}{a^{-1}} = abc$$

12. Factor the expression below completely.

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

see 4 terms! factor by grouping

$= (x^2 - 4)(x^3 - 1) = (x-2)(x+2)(x^3 - 1)$

13. Suppose the function $f(x)$ is given. Describe how the graph of $g(x) = f(x) + 1$ is obtained from the graph of $f(x)$. Repeat for $h(x) = f(x-1)$ and $k(x) = 3 * f(x)$.

subtract 1 on inside $\Rightarrow$ translation right 1 unit

1 added on outside $\Rightarrow$ vert. translation up 1 unit

mult. on outside by 3, $\Rightarrow$ vertical stretch

14. Perform the indicated operations and simplify

$$\frac{y}{y}\frac{26}{2x} - \frac{7y}{2xy} + \frac{3}{xy}\frac{2}{2} = \frac{12y - 7y + 6}{2xy}$$

$$= \boxed{\frac{5y + 6}{2xy}}$$