Name_____ID_____Section_____

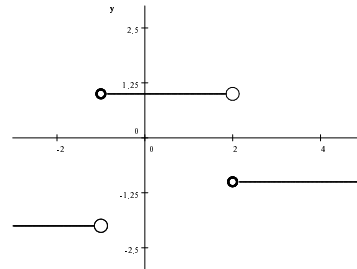## Multiple Choice (4 points each)

1. Write the statement as inequalities: p is not between 2 and 4.

   a. $2 < p$ or $p < 4$
   b. $2 > p$ or $p > 4$
   c. $2 < p$ and $p < 4$
   d. $2 > p$ and $p > 4$
   e. None of these

2. Give the formula for the function whose graph is

a. $f(x) = \begin{cases} -2 & \text{if} & x < -1 \\ 1 & \text{if} & -1 \le x < 2 \\ -1 & \text{if} & 2 \le x \end{cases}$

d. $f(x) = \begin{cases} -1 & \text{if} & x < -1 \\ 1 & \text{if} & -1 \le x \le 2 \\ -2 & \text{if} & 2 < x \end{cases}$

b. $f(x) = \begin{cases} -1 & \text{if} & x \le -1 \\ 1 & \text{if} & -1 < x \le 2 \\ -2 & \text{if} & 2 < x \end{cases}$
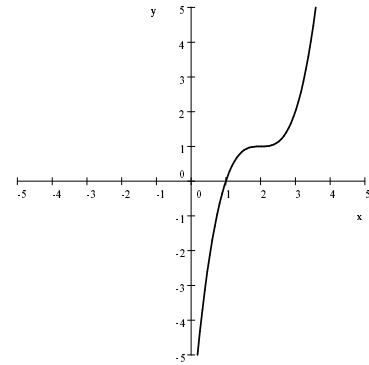
e. $f(x) = \begin{cases} -2 & \text{if} & x \le -1 \\ 1 & \text{if} & -1 < x < 2 \\ -1 & \text{if} & 2 \le x \end{cases}$

c. $f(x) = \begin{cases} -2 & \text{if} & x < -1 \\ 1 & \text{if} & -1 \le x \le 2 \\ -1 & \text{if} & 2 < x \end{cases}$

3. Use Pascal's triangle or the binomial formula to expand $(x - 2)^3$.

   a. $x^3 + 2x^2 + 4x + 8$
   b. $x^3 - 2x^2 + 4x - 8$
   c. $x^3 + 3x^2 + 3x - 8$
   d. $x^3 + 6x^2 + 12x + 8$
   **e.** $x^3 - 6x^2 + 12x - 8$

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4. The graph at the right is the graph of which function?

  a. $(x-1)^3 + 2$
  b. $(x-1)^3 - 2$
  c. $(x+1)^3 + 2$
  d. $(x-2)^3 + 1$
  e. $(x+2)^3 + 1$

5. Find the angle between the vectors $\vec{u} = (-3,3,0)$ and $\vec{v} = (-2,1,1)$.
  a. $0°$
  b. $30°$
  c. $45°$
  d. $60°$
  e. $90°$

6. If $\vec{a} = (2,-1,3)$ and $\vec{b} = (2,4,1)$, then $3\vec{a} - 2\vec{b} =$
  a. $(10,-5,11)$
  b. $(10,5,11)$
  c. $(2,-11,7)$
  d. $(2,11,7)$
  e. $(0,-5,2)$

7. If $\vec{a} = (2,-1,3)$ and $\vec{b} = (2,4,1)$, then $\vec{a} \cdot \vec{b} =$
  a. $(4,-4,3)$
  b. $(4,4,3)$
  c. -48
  d. 3
  e. 11

8. Compute the limit $\qquad \lim_{x\to 3} \dfrac{x^2 - 2x - 3}{x^2 - 4x + 3}$
  a. 0
  b. 1
  c. 2
  d. 3
  e. 4

9. Suppose the function $f(x)$ is discontinuous at $x = 1, 3, 7$ only.
Where is the function $g(x) = f(x - 2)$ discontinuous?

    a. $1, 3, 7$

    b. $2, 6, 14$

    c. $-2, -6, -14$

    d. $-1, 1, 5$

    e. $3, 5, 9$

**10.** For the function $f(x) = x^3$, find the slope of the secant line between $a = 1$ and $a + h = 3$.

    a. 13

    b. 15

    c. 26

    d. 27
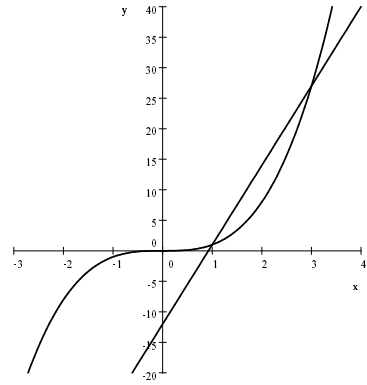
    e. 30

11. For the function $f(x) = 2x + 3$, find $f'(4)$, the derivative at $x = 4$.

    a. 2

    b. 3

    c. 4

    d. 5

    e. 11

12. For the function $f(x) = \sqrt{x}$, find the derivative function, $f'(x)$.

    a. $\dfrac{1}{2x}$

    b. $\dfrac{1}{\sqrt{x}}$

    c. $\dfrac{1}{4} + C$

    d. $\dfrac{1}{2\sqrt{x}}$

    e. $\dfrac{1}{2}x^{3/2}$

13. (8 points) Consider the triangle with vertices $A = \langle 1, 2 \rangle$, $B = \langle 4, 1 \rangle$ and $C = \langle 2, 3 \rangle$. Find the altitude from the vertex C to the base $\overline{AB}$.

Hint: Use one of the following methods:

(1) First find the area.

(2) Find the distance from the point C to the line $\overline{AB}$.

(3) Find the projection of $\overrightarrow{AC}$ orthogonal to $\overrightarrow{AB}$.
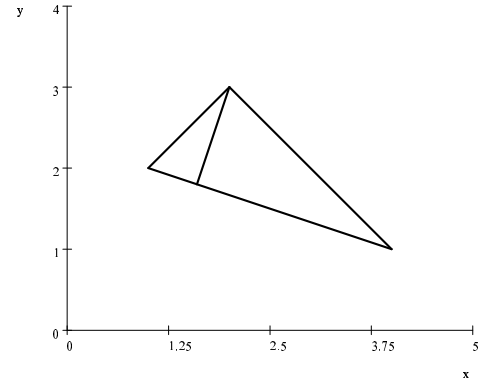
14. (8 points) An object is dragged 10 feet across the floor, using a force of 85 pounds. Find the work done if the direction of the force is 60° above the horizontal.

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15. (8 points) A physics student has constructed a catapult that will shoot a projectile a considerable distance. She has determined the flight of the projectile can be modeled by the following parametric equations: $x = 24\sqrt{2}\,t$ and $y = -16t^2 + 24\sqrt{2}\,t$. Determine how long the projectile will remain in the air and the distance it will travel using her model equations.

16. (8 points) Explain whether the function $f(x) = \begin{cases} x & \text{if} & x < 1 \\ 2 - x & \text{if} & 1 \leq x < 2 \\ x^2 & \text{if} & 2 \leq x \end{cases}$ is

continuous or discontinuous at $x = 1$ and at $x = 2$.

17. (10 points) Find the derivative of $f(x) = \frac{5}{x} + 3x^2$ by the secant method.

18. (10 points) Find the equation of the line tangent to the curve $y = x^2$ at $x = \pi$. You must find the slope by the secant method.