Calculus 1          **Review for Exam #2 – sections 3.2 –3.7, 4.1 - 4.6**

**1.** Find the average rate of change of $f(x) = x^2 - 6x - 1$ on [-1,3].

**2.** A projectile is shop upward from the surface of the earth according to the position function $s(t) = -16t^2 + 256t$.

**a)** Find the velocity when t = 1.

**b)** At what time does the projectile reach its maximum height?

**c)** What is the max height?

**d)** How long does it take for the projectile to reach the ground?

**e)** What is the velocity when it hits the ground?

**f)** What is the acceleration function, a(t)?

**3.** Find $f'(x)$

**a)** $f(x) = \frac{3x^5 - 7x + 10}{\sqrt{x}}$   **b)** $f(x) = (3x + 2)^{10}(x^2 + 7x)$   **c)** $f(x) = \frac{(5x+7)^{50}}{2x-3}$

**d)** $f(x) = [2x + 3(5x + 1)^{10}]^{100}$

**4.** Find $\frac{dy}{dx}$ if $xy^2 - yx^2 = 2$.  Find the equation of the tangent line at (1, 2).

**5.** A spherical balloon is inflated with air at the rate of 10 cu ft/min.  How fast is the radius of the balloon increasing when the radius is 5 ft. /

**6.** Sand is falling off a conveyor belt onto a conical pile at the rate of 20 cu ft/min.  The diameter of the base of the cone is approx. equal to the altitude.  At what rate is the radius increasing when the pile is 10 ft. high?

**7.** A ladder 10 ft long is leaning against a building.  The bottom of the ladder is being pulled away from the building  at the rate of 3 ft/sec.  How fast is the distance from the top of the ladder to the ground changing when the base of the ladder is 6 ft away from the building?

**8.** Find the absolute max and absolute min of $f(x) = (x-2)^2$ on the interval [1,5].

**9.** Find where f increases and decreases. Find all relative max and relative min's.

**A)** $f(x) = x^3 - 12x^2$  **B)** $f(x) = 3x^{2/3}(x-2)$  **C)** $f(x) = \frac{x^2-16}{x-5}$  **D)** $f(x) = \frac{x^2-3x-4}{x-2}$

**10.** Find the intervals where f is concave up and concave down. Find inflection points.

**A)** $f(x) = x^3 + \frac{5x^2}{2} - 14x + 3$  **B)** $f(x) = 3x^4 + 4x^3 + 6x^2 + 1$

**11.** Find the "end-behavior" ($\lim_{x\to\infty} f(x)$  $\lim_{x\to\infty} f(x)$ )

**A)** $y = \frac{x^5-200x+3}{-2x^2+30}$  **B)** $y = \frac{\sqrt{x}-400}{\sqrt{x^2+2}}$  **C)** $y = \frac{7x^5-200x^4}{3x^5-7x^3+200}$  **D)** $y = -3x^{16} - 400x^{10}$

**12.** Sketch the curve. Find x-int, y-int, asympt., end-behavior, intervals where f inc and dec, max, min, intervals where f is concave up and down, and inflection points

**A)** $f(x) = x^4 - 4x^2$  **B)** $f(x) = 3x^4 - 20x^3 + 36x^2$  **C)** $f(x) = \frac{x^2}{x^2-1}$

**13.** State the mean value theorem. For $f(x) = \frac{x+1}{x}$ find all values c in $(\frac{1}{2}, 2)$ such that $f'(c) = \frac{f(b)-f(a)}{b-a}$.

\* no curve sketching on exam 2